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## CONTENTS OF VOL. XXXIV, NO. 9.

Recent work in agricultural science.....	Page. 801
Notes.....	900

## SUBJECT LIST OF ABSTRACTS.

### AGRICULTURAL CHEMISTRY—AGROTECHNY.

A handbook of colloid chemistry: Ostwald, translation by Fischer et al.....	801
Industrial and manufacturing chemistry.—I. Organic, Martin et al.....	801
Technology of the organic chemical industries, edited by Binz.....	801
The chemical technology of fermentation and food stuffs, edited by Hayduck..	801
Chemical changes in the souring of milk, Van Slyke and Bosworth.....	802
Chemical changes during the ripening of the wild-geese plum, McHargue.....	802
The essential oil of sugi ( <i>Cryptomeria japonica</i> ) leaves, Uchida.....	802
Essential oil of Formosan hinoki ( <i>Chamaecyparis obtusa</i> ) wood, Uchida.....	802
Thermal values of the fats and oils.—I, The heat of bromination, Marden.....	803
The action of bromin on proteins and amino acids, Siegfried and Reppin.....	803
Constitution of proteins of flour and relation to baking strength, Blish.....	803
Refractive indices of solutions of certain proteins.—IX, Edcestin, Schmidt....	803
Preparation of glucosamin hydrochlorid from mucoid from ascitic fluid, Oswald.	803
Enzym investigations.—X, The enzymatic synthesis of disaccharids, Löb....	803
Influence of certain substances on activity of invertase, Griffin and Nelson....	803
Occurrence of arginase and determination by formol titration, Edlbacher.....	804
A hydrogen electrode vessel, Clark.....	804
A simple sodium lamp for polariscope, Foresman.....	804
A large fat extractor, Schmidt.....	804
Soda lime as an energetic general reagent, Guareschi.....	804
Rapid method of converting scrap platinum into chloroplatinic acid, Tingle..	804
A possible source of error in colorimeter observations, Long.....	805
An evaluation of methods for determination of phosphoric acid, Sichmann....	805

	Page.
Easily extractable phosphorus and phosphorus nutrition, Jakouchkine.....	805
The decomposition of tetrathionates in alkaline solution, Chapin.....	805
Report of International Commission for Chemical Soil Analysis, Munich, 1914..	806
Potassium permanganate for determination of humus in soils, Grigorief.....	806
The humus of the loess soils of the transition region, Blish.....	806
A comparison of methods for the determination of soil phosphorus, Robinson..	806
A limestone tester, Hopkins.....	806
Some new methods for the analysis of lime-sulphur solutions, Chapin.....	806
Determination of halogens in organic compounds, Drogin and Rosanoff.....	806
A method for the estimation of chlorids in cheese, Cornish and Golding.....	807
The determination of acidity in potatoes, Hoffmann and Preckel.....	807
Analysis of maple products.—V, Miscellaneous observations on sirup, Snell.....	807
The determination of small amounts of sugar in urine, Nagasaki.....	807
The determination of amino acids in urine, Bang.....	808
New indican reaction, Jolles.....	808
Nephelometric determination of essential oils, Woodman et al.....	808
The utilization of cherry by-products, Rabak.....	808

SOILS—FERTILIZERS.

Soil survey of Lee County, Iowa, Davis and Sar.....	809
Soil survey of Cherokee County, Kans., Wood and Throckmorton.....	809
Soil survey of Reno County, Kans., Carter, jr., et al.....	809
Soil survey of Union County, N. C., Derrick and Perkins.....	810
Soil survey of Portage County, Ohio, Mooney et al.....	810
Analyses of typical soils, Ames.....	810
Geo-agronomic study of farm lands in Perugia, Marcarelli.....	810
Soils study of the lower Rhine districts, Zimmermann.....	811
Successful soil-sampling tools, Shaw.....	811
Recent brown soil and humus formation in Java and the Malay Peninsula, Lang	811
Determination of amino acids and nitrates in soils, Potter and Snyder.....	811
The amino acid nitrogen of soil, Potter and Snyder.....	811
Origin of the "niter spots" in certain western soils, Sackett and Isham.....	811
Origin of the "niter spots" in certain western soils, Stewart and Peterson.....	812
The variation of the fertility and productivity of the soil, Gedroïts.....	812
The development of a dynamic theory of soil fertility, Cameron.....	812
The difference between rye and wheat soils, Stulzer and Haupt.....	813
Influence of soil condition on the bacterial life, Christensen.....	813
Azotobacter in woods and lime requirements, Weis and Bornebusch.....	814
The nonsymbiotic nitrogen-fixing soil bacteria and their importance, Duggeli.....	815
The fixation of potash by soil bacteria, Kyropoulos.....	815
The antizymotic action of salicylic aldehyde and mannite, Skinner.....	815
The importance of soil colloids for agriculture and forestry, Rohland.....	816
Colloidal clay, Ehrenberg and Given.....	816
Moisture relations to some Texas soils, Fraps.....	816
Absorptive power of soils of Mauritius, De Sornay.....	816
The adsorption of potassium by the soil, McCall et al.....	817
Absorption of ultraviolet and infra-red rays by soil, Tristan and Michaud.....	817
Soil temperatures, Leather.....	818
Droughts, rainfall, and soil erosion.....	818
The prevention and control of erosion in North Carolina, Baker.....	819
Increase of ecological value of light soils by intermixing clay, Schneider.....	819
Use of dynamite in improvement of heavy clay soils, Call and Throckmorton..	820
The box method of testing manurial requirements of soils, Baylis.....	820
Liquid manure.....	820
The nitrogen of sodium nitrate, ammonium sulphate, and lime nitrogen, Herke..	820
Relative action of nitrogen of lime nitrogen and of sodium nitrate, Gyárfás.....	820
Cause of red coloration sometimes observed on decomposing Thomas slag, Ditz.	820
The pebble phosphates of Florida, Sellaris.....	821
Possible sources of potash in America, Cameron.....	821
Statistical potash fertilizer experiments in 1914, Hoffmann.....	821
Importance of fineness to utility of crushed limestone, Thomas and Frear.....	821
The lime magnesia ratio in soil amenduents, Thomas and Frear.....	821
The effects of radio-active ores and residues on plant life, Sutton.....	821
Influence of radio-active earth on plant growth and crop production, Rushy.....	822
Some chemical aspects of the peat problem, Morgan.....	822
Commercial fertilizers, Curtis and Rodex.....	822

# CONTENTS.

III

## AGRICULTURAL BOTANY.

	Page.
Experimental studies in the physiology of heredity, Blackman et al.	822
Heredity and mutation as cell phenomena, Gates	823
Genetical studies on <i>Oxalis</i> , Nohara	823
Self-pollination and artificial cross-pollination in rice, Farneti	823
The nature of peloria in flowers, Sirks	823
The nature of peloria, Sirks	823
Recent studies on the formation of flower-coloring materials, Schiemann	824
Relation between vegetative vigor and reproduction in <i>Saprolegniaceae</i> , Pieters	824
Influence of nutrition on sexual organs in fern prothallia, Nagai	824
Relation of moisture to seed production in alfalfa, Martin	824
Presence and physiological significance of tannin in plants, van Wisselingh	825
Elaioplasts in monocotyledons and dicotyledons, Politis	825
The electrical conductivity of sap in vegetable tissues, Mameli	825
Studies on wilting, drying, and returgescence of plants, Holle	825
Relations of plants to distilled water and dilute toxic solutions, Merrill	825
Electrolytic determination of exosmosis from the roots of plants, Merrill	826
The question of the toxicity of distilled water, Hibbard	827
Plant records of an expedition to Lower California, Goldman	827
New or noteworthy plants from Colombia and Central America, V. Pittier	827

## FIELD CROPS.

Moisture content and shrinkage of forage, Vinall and McKee	827
Method of correcting for soil heterogeneity in variety tests, Surface and Pearl	829
Colonial plants.—Textile plants, Junelle	829
The curing of blue-grass seeds as affecting viability, Garman and Vaughn	829
Testing seed corn, Williams	830
Cotton experiments, 1915, Brown	830
Report on variety tests of cotton for 1915, Winters and Herman	831
Japanese cane, Scott	831
Sudan grass, Williams	831
Manual experiments on sugar cane, 1912-1914, de Verteuil	831
Manual experiments on sugar cane, 1912-1915, de Verteuil	832
Proceedings of Association of Official Seed Analysts of North America, 1914	832
Results of seed inspection, 1914, Helyar and Schmidt	832

## HORTICULTURE.

Subtropical vegetable gardening, Rolfs	833
Vegetable culture, Van Hermann and Cunliffe	833
Cabbage, Price and Stelzenmuller	833
Early peas tried at Wisley, 1915, Titchmarsh	833
Factors affecting regular bearing in orchards, Gourley	833
Bridge grafting of fruit trees, Fletcher	833
Pruning, Chandler and Knapp	833
Apple and pear growing, Allen	833
Grass mulch culture of apple orchards, Ballou	833
The methods of propagation of the best varieties of perry pears, Truelle	834
Fertilizer experiments with cranberries, New Jersey, 1915, Schlatter	834
Resistance of various gooseberry varieties against mildew, Kock	834
Strawberry culture, Jimenez	834
Note on some grapes of French-American and American hybrid vines, Tornello	834
Muscadine grapes, Husmann and Dearing	834
The raisin industry, Husmann	835
[Varieties of the avocado], Popenoe	835
Study on the chayote ( <i>Sechium edule</i> ), Herrera	835
Features of the grapefruit in California, Shamel	835
The consumer's dollar working backwards, Powell	835
Seed gardens	835
Fertilizer experiments at Malabar, II, Bosscha	835
The production and commerce of nuts in Asia, Rigotard	835
Experiments in forcing the lily-of-the-valley by warm water, Langer	835
[Phloxes and pyrethrums at Wisley, 1915], Titchmarsh	836
House and window plants, Bois	836
Fertilizing lawn and garden soils, Brown	836
The North Dakota farmstead, its arrangement and adornment, Werner	836
Gardeners' and florists' annual for 1916, edited by Dick	836

FORESTRY.		Page.
Laws, decisions, and opinions as to National Forests, compiled by Feagans.....		837
Seventh report of the state forester.—Forestry in Vermont, Hawes.....		837
Eighth annual report of the Washington Forest Fire Association, 1915.....		837
Report of forestry committee, Hawaiian Sugar Planters' Association, Thurston.....		837
The Eberswalde forest-seed testing station and methods of testing, Schwappach.....		837
Forest administration in Baluchistan for 1914-15, Mulraj.....		837
Progress report of forest administration in Bihar and Orissa for 1914-15, Haines.....		837
Forest administration in Madras Presidency for 1915, Lushington et al.....		837
Forest administration in Northwest Frontier Province for 1914-15, Mayes.....		838
Report of the department of forestry for 1915, Dalrymple-Hay.....		838
Forest trees and shrubs of the Missouri River basin, Fammcl et al.....		838
A mill scale study of western yellow pine, McKenzie.....		838
Colonial plants.—Latex and resin yielding plants, Jumelle.....		838
[Papers on rubber culture and the rubber industry].....		838
Manurial experiments with young rubber at Kuala Lumpur, Spring.....		838
The natural reproduction of sal, Troup.....		839
The formation of annual rings of <i>Tectona grandis</i> , Geiger.....		839
Reproduction of teak by root suckers, Marsden.....		839
Teak working plans in Burma, Watson.....		839
The most exact method of measuring teak trees and teak stands, Beekman.....		839
The care and improvement of the woodlot, Tillotson.....		839
Marketing of woodlot products in Kentucky, Sterrett.....		839
Utilization of southern wood waste, Little.....		839
Wood flour, Kressmann.....		839
DISEASES OF PLANTS.		
The International Phytopathological Convention of Rome, Rogers.....		840
Vegetable pathology, Bois.....		840
[Effect of meteorological conditions on plant disease], Dorogin.....		840
The genus <i>Fusarium</i> in plant pathology, Gandara.....		840
An Asiatic species of <i>Gymnosporangium</i> established in Oregon, Jackson.....		840
<i>Purenochata elodæ</i> n. sp., Orshanskaia.....		840
<i>Rhizoctonia crocorum</i> and <i>R. solani</i> ( <i>Corticium vagum</i> ), Duggar.....		840
Notes on plant parasitic nematodes, Byars.....		841
[Plant diseases in Barbados], Dash.....		841
[Plant pests and diseases in Grenada], Moore.....		841
[Work of the Bureau of Mycology and Phytopathology], Iachevskii.....		842
An investigation of the mycological flora in Astrakhan, Shembel.....		842
[Report of the plant pathologist], Barbarin.....		842
Observations on parasitic fungi in the Province of Podolsk, Dobrovol'skii.....		843
[Report on plant diseases], Stockdale.....		843
Duration of resistance of plants and insects to hot water.....		843
Burgundy mixture as a substitute for Bordeaux mixture, Nowell.....		843
Fungicide experiments, 1914, Darnell-Smith.....		843
[Potassium permanganate treatment for seed grains], Egert.....		844
Blight in maize.....		844
Flower-bud and boll shedding of cotton in Florin Province, Nigeria, Thornton.....		844
<i>Helmintosporium turcicum</i> , Zhavoronkova.....		844
Crown gall of mangels.....		844
Wart disease, Malthouse.....		844
Beet tumors, Peklo.....		845
Stomatal movement and infection by <i>Cercospora beticola</i> , Pool and McKay.....		845
A fungus of uncertain systematic position occurring on wheat and rye, O'Garra.....		845
Fungus diseases of wheat, Darnell-Smith and Mackinnon.....		845
Seedling time and attack by stinking smut, Appl.....		845
A Phoma disease of western wheat grass, O'Garra.....		846
Gummosis, or the gumming of fruit trees, Darnell-Smith and Mackinnon.....		846
[ <i>Venturia inaequalis</i> and <i>V. pirina</i> in pure cultures], Novouspenskiï.....		846
[ <i>Fusicladium pirinum</i> in pure cultures], Iachevskii.....		846
[On the etiology of Stippigkeit], Serbinov.....		846
[White and brown fruit spot of pear], Serbinov.....		846
Experiments on American gooseberry mildew in Cambridgeshire, Brooks et al.....		847
Studies in physiology of parasitism.—I, Action of <i>Botrytis cinerea</i> , Brown.....		847
Peroicid as substitute for copper sulphate for <i>Peronospora</i> , Gvozde noviç.....		847
Hibernation of powdery mildew in Hungary, Ibos.....		847

# CONTENTS.

V

	Page.
A banana disease in Cuba, Johnston.....	847
<i>Murasmus perniciosus</i> n. sp., cause of krulloten disease of cacao, Stahel.....	847
Coffee leaf disease ( <i>Hemileia vastatrix</i> ) in Uganda, Simpson and Small.....	848
Citrus canker, Cook.....	848
Citrus canker in America. The outbreak of a new disease, Darnell-Smith.....	848
Discovery of chestnut blight parasite in Japan, Shear and Stevens.....	848
The chestnut bark disease in Vermont, Ross.....	848
Diseases of Hevea in Ceylon, Petch.....	849
[A larch leaf disease], Lebedeva.....	849
<i>Peridermium harknessii</i> and <i>Cronartium quercum</i> , Meinecke.....	849
Brown oak and its origin, Groom.....	849
ECONOMIC ZOOLOGY—ENTOMOLOGY.	
Birds of Porto Rico, Wetmore.....	849
Peculiarity in growth of tail feathers of giant hornbill, Wetmore.....	850
Strychnin sulphate.—Its effect on California valley quail, Pierce and Clegg.....	850
Five new mammals from Mexico and Arizona, Goldman.....	850
Descriptions of a new genus and seven new races of flying squirrels, Howell.....	850
Five new rice rats of the genus <i>Oryzomys</i> from Middle America, Goldman.....	850
Distribution and combat of field mouse in Bavaria from 1902 to 1913, Hiltner.....	850
A systematic account of the grasshopper mice, Hollister.....	850
Medical and veterinary entomology, Herms.....	850
[Papers on insects and insect control].....	850
Work of the colonial entomologist, Mayné.....	851
[Report of the entomologist of Southern Nigeria], Lamborn.....	851
Insect pests of wheat, Gurney.....	851
Some of the more important truck crop pests in Georgia, Reed.....	851
Carbon bisulphid and its use for grain fumigation, Goodwin.....	851
[Cranberry insects in Wisconsin], Malde.....	851
Blueberry insects in Maine, Woods.....	851
Insects affecting the coconut palm in Trinidad, Ulrich.....	853
Insects as carriers of the chestnut blight fungus, Studhalter and Ruggles.....	853
Hydrocyanic acid gas against household insects, Howard and Popenoe.....	853
Orthoptera of the Yale-Dominican expedition of 1913, Caudell.....	854
Genera of subfamily Rhaphidophorinae found north of Mexico, Caudell.....	854
[Migratory locusts in South America].....	854
Jerusalem's locust plague, Whiting.....	854
Observations on <i>Chermes</i> spp. in Switzerland, Cholodkovsky.....	854
Identity of <i>Eriosoma pyri</i> , Baker.....	854
Destruction of body lice by oil of eucalyptus, Sergeant and Foley.....	854
Descriptions of new species and genera of Lepidoptera from Mexico, Dyar.....	855
Lepidoptera of the Yale-Dominican expedition of 1913, Dyar.....	855
Report on the Lepidoptera of the Panama Canal Zone, Dyar.....	855
New genera and species of Microlepidoptera from Panama, Busck.....	855
The injurious Microlepidoptera of the fir and spruce, Trägårdh.....	855
The noctuid moths of the genera <i>Palindia</i> and <i>Dyonix</i> , Dyar.....	855
The pickle worm or cucumber worm ( <i>Diaphania nitidalis</i> ), Garman.....	855
The practical employment of the cacao moth parasite, Roepke.....	855
Two new Canadian Diptera, Aldrich.....	855
New western and southwestern Muscoidea, Townsend.....	855
Diagnoses of new genera of muscoid flies founded on old species, Townsend.....	855
The house fly, Fitzsimons.....	855
The sporogony of <i>Hamoproctus columbae</i> , Adie.....	855
Fighting the fly peril, Plowman and Dearden.....	856
Report on a mosquito survey at the mouth of the Connecticut, Buttrick.....	856
Anopheles as a winter carrier of plasmodium, Mitzmain.....	856
The duck as a preventive against malaria and yellow fever, Dixon.....	856
<i>Anastrepha serpentina</i> , a new pest of fruits in Brazil, Tavares.....	856
Relations of Mediterranean fruit fly and citrus fruits, Savastano.....	856
Two new species of <i>Pipunculus</i> , Knab.....	857
Notes on some Virginian species of <i>Platyptera</i> , Banks.....	857
Life history and control measures for the cereal leaf beetle, Kadocsa.....	857
The western 12-spotted cucumber beetle, Essig.....	857
Problem of the bark beetle, Swaine.....	857
Species of Rhynchites and <i>Anthonomus pomorum</i> injuring orchards, Schreiner.....	857
Boil weevils hibernating in cotton seed.....	857
The Mexican bean weevil, Amundsen.....	857

	Page.
New genera of chalcidoid Hymenoptera, Girault.....	857
Vespid and sphecoid Hymenoptera collected in Guatemala, Rohwer.....	857
West Indian wasps, Ballou.....	857
Observations on the biology of Ixodidae, II, Nuttall.....	857
[Studies of Cimex], Cragg.....	857
On the life history and morphology of <i>Clonorchis sinensis</i> , Kobayashi.....	858
Morphology and life history of <i>Crithidia leptocoridis</i> n. sp., McCulloch.....	858
Life history of an ameba of the Limax group ( <i>Vahlkampfia calkeni</i> ), Hogue.....	858
Identification of stages in asexual cycle of <i>Bartonella bacilliformis</i> , Townsend.....	858

## FOODS—HUMAN NUTRITION.

The velocity of the staling of bread, Katz.....	858
The staling of bread, Katz.....	859
The staling of bread from the physiological-chemical standpoint, I-III, Katz.....	859
Changes in structure of bread during staling, Verschaffelt and van Teutem.....	859
How to grow the peanut and 105 ways of preparing it, Carver.....	859
Recent observations in the use of soy bean in infant feeding, Sinclair.....	859
Ice-cream making, Baer.....	860
The manufacture of ice creams and ices, Frandsen and Markham.....	861
[Report of food and drug laboratory], Barnard.....	861
Electric cooking in a cafeteria, Hannon.....	861
School lunches, Hunt and Ward.....	861
The child and its care, Knowles, Campbell, and Bentley.....	861
The physiology of the newborn infant, Benedict and Talbot.....	862
Acceleration of growth after retardation, Osborne et al.....	862
Studies in water drinking.—XX, Relationship to certain life processes, Hawk.....	862
The relation of salivary to gastric digestion, Maxwell.....	862
Gastrointestinal studies.—XII, Duodenal regurgitation, Spencer et al.....	863
Green color in mother's milk after the ingestion of liver, Feer.....	863
Fasting studies.—XIV, Elimination of urinary indican, Sherwin and Hawk.....	863

## ANIMAL PRODUCTION.

Experiments on the Mendelian laws of inheritance, Pucci.....	864
Variability under inbreeding and cross-breeding, Castle.....	864
[Mice breeding experiments], Weldon.....	864
The determination of sex, Regnault.....	864
Duration of spermatozoa after fecundation in pullet and the duck, Chappellier.....	864
Effect of castration on weight of pituitary body and other glands, Livingston.....	865
Studies on the carotin group of the animal body.—I, Insecta, Schulze.....	865
Studies of the carotin-xanthophyll group, II, Schulze.....	865
The palatability of farm grasses, Williams.....	865
Kafir corn ("dari") from South Africa.....	865
Comparative experiments with feed roots, 1912-1914, Bolin.....	865
Value of blood and other offal for feeding purposes.....	866
The breeds of live stock, Gay.....	866
Steer feeding, Burns.....	867
Relation of steer feeding to farm returns, Willson.....	867
Profits and losses in cattle feeding.....	868
Calf-feeding experiments.....	868
Methods of handling sheep in California, Ellenwood.....	868
Lambing methods in national forests of Southwest, Hill.....	868
Improved management of national forest stock, Barnes.....	869
Corriedale sheep record association.....	869
A demonstration test of swine rations.....	869
Clover meal as a feed for swine, Zur Horst.....	869
A study of hog profits and losses.....	869
Meat and blood meal as a supplement to oats for horses, Westmattelmann.....	869
Breeding and training of the horse, Bonnefont.....	869
Mechanics applied to the race horse, Couste, trans. by Cassatt.....	869
The sensation of the Percheron world.....	869
The Missouri Poultry Experiment Station, Patterson.....	870
Can selection cause genetic change? Castle.....	870
A feminized cockerel, Goodale.....	871
Feeding chicks grain mixtures of high and low lysin content, Buckner et al.....	871
When to feed the baby chick, Kaupp.....	872
Poultry raising in Wisconsin, Halpin and Hayes.....	872
Ostrich breeding, Sokolowsky.....	872
A successful experiment in skunk farming, Jones.....	872

# CONTENTS.

VII

## DAIRY FARMING—DAIRYING.

	Page.
Feeding experiments with dairy cattle, Goldschmidt .....	873
The utilization of beets in cattle feeding, Malpeaux .....	873
The utilization of cassava flour in the feeding of dairy cattle, Lucas .....	873
The value of cod-liver meal as a dairy cattle feed, Isaachsen et al. ....	873
The feeding of sesame cake to dairy cattle, Giuliani .....	874
The agricultural colleges and stations in relation to milk supply, Stocking ..	874
Milk and cream contests, Kelly, Cook, and Gamble .....	874
[Use of milk and milk products] .....	874
Experiments in pasteurizing milk in Denmark, Lund .....	874
Control of acidity, catalase, and reductase by biorization, Kooper .....	875
Experiments in cheese making from milks of different fat contents, Lund .....	875

## VETERINARY MEDICINE.

Lymphatic glands in meat animals, Godbille, trans. by Liantard and Hughes ..	876
A practicum of bacteriology and protozoology.—I, Bacteriology, Kisskalt .....	876
Yearly progress in veterinary medicine, edited by Ellenberger et al. ....	876
Wound treatment, Merillat, Hoare et al. ....	876
Antiseptic methods in treatment of infected wounds, Cazin and Krongold .....	876
The germicidal power of glycerin on various micro-organisms, Ruediger .....	876
Changes of bacteria in the animal body .....	877
Complement fixation in varicella, Kolmer .....	877
Complement fixation in vaccinia and variola, Kolmer .....	877
The fate of various antibodies in the precipitin reaction, Gay and Stone .....	877
Kidney lesions in chronic anaphylaxis, Boughton .....	878
Biological researches on the eosinophils, Weinberg and Séguin .....	878
Biological researches on the eosinophils, II, Weinberg and Séguin .....	878
Toxins of intestinal parasites, Paulian .....	879
Morphology of adults of filaria found in Philippine Islands, Walker .....	879
Development of free living generations of lungworms, von Linden and Zenneck ..	879
African coast fever, Bevan .....	879
Anthrax, de Castro y Ramirez .....	879
Vaccination experiments against anthrax, Eichhorn .....	879
Investigation of foot-and-mouth disease, Kallert .....	879
Concerning the filterability of trypanosomes, Wolbach, Chapman and Stevens ..	880
Effect of daylight and drying on tubercle bacilli, Findlay and Martin .....	880
The intracutaneous tuberculin of chickens, Van Leeuwen .....	880
The success of the tuberculin test in certified dairies, Roadhouse .....	880
Diagnosis of infectious abortion in cattle by the Abderhalden procedure, Katz ..	880
Further contribution on biology of <i>Hypoderma lineatum</i> and <i>H. bovis</i> , Hadwen ..	881
Trichinosis.—Case with the trichina larvæ in the spinal fluid, Bloch .....	881
Salvarsan treatment of infectious catarrh of upper respiratory tract, Barthel ..	881
Some further studies of chick mortality, Kaupp .....	881
The diseases of poultry, Ehrhardt .....	881

## RURAL ENGINEERING.

Flow through weir notches with thin edges and full contractions, Cone .....	881
Notes on the duty of water, Beardsley .....	883
The use of mud-laden water in drilling wells, Knapp .....	884
Irrigation in Netherlands East India .....	884
Surface water supply of north Pacific drainage basins, 1912, Grover et al. ....	884
Water powers of Cascade Range.—III, Yakima River basin, Parker and Storey ..	884
The regulation of rivers, Van Ornum .....	885
Proceedings of eleventh meeting of Iowa State Drainage Association .....	885
Proceedings of N. C. Drainage Association, 1914, compiled by Pratt and Berry ..	885
The hydraulic ram, Robb .....	885
Electrically driven dragline scrapers dig 45-mile irrigation canal .....	885
A comparison between bleach and liquid chlorin disinfection, Avery .....	885
Does alum inhibit the action of chlorin as a disinfectant? Avery and Lye .....	885
American sewerage practice, Metcalf and Eddy .....	886
Septic tanks and absorption systems, Beckwith and Toeter .....	887
Sewage treatment where sewerage system is not available, Hansen .....	888
Economy of deep percolating filters, Clark .....	888
Oxidation of sewage without aid of filters, II, Arden and Lockett .....	888
Oxidation of sewage without aid of filters, III, Arden and Lockett .....	888

	Page.
Economic possibilities of sludge from Emscher or Travis tanks, de Laporte	889
Tables facilitate accuracy in timber beam design, Hardman	889
Influence of temperature on the strength of concrete, McDaniel	889
Use of water-gas tar and coal tar on concrete subjected to water, Paul	889
The use of concrete for protecting wood-stave pipe, Heron	890
Determination of the physical properties of road-building rock, Jackson, jr.	890
Proceedings of thirteenth meeting of Ontario Good Roads Association, 1915	890
Annual report on highway improvement, Ontario, 1914	890
Report of the surveyor general for the year 1914, Spowers	890
When the boiler needs attention	890
How to install the farm gasoline engine, Mathewson	891
Antifreezing solutions for your engine, Shattuck	891
General notes on power farming, Wiggins	891
Directory and specifications of gasoline and oil farm tractors	891
The latest idea in tractor harvesting, Watson	891
Daily working capacities of motor plows and their determination, Thalmayer	891
The practical value of model tests on the plow, Bernstein	891
Trial of steam threshers at Lyallpur, Roberts	891
Using the modern grain separator, Conner	891
Test of a separator for cold milk, Nachtwch	891
List of farm building plans	892
Silos, Scoates	892
Refrigeration and its increasing importance for different purposes, Ahrens	892
Ice on the farm, Nelson	892

## RURAL ECONOMICS.

The settlement of public lands in the United States, Hibbard	892
The demand for agricultural products and some consequences, Thompson	892
The marketing of farm products, Weld	893
Carlot distribution, Crutchfield	893
[Purchase and marketing associations in Posen and West Prussia] Niklewski	893
Central Bureau and Netherlands Agricultural Committee, van Genderen Stort	893
Report on cooperative credit societies in Ajmer-Merwara, 1913-14	893
Report on cooperative societies in Central Provinces and Berar, 1914-15	894
Report on the working of the cooperative societies in the Punjab, 1915	891
How to finance the farmer, Herrick and Ingalls	894
Rural organization, community, county, division, State, Morgan and Bryson	895
Country life week, 1915	895
Rural housing, Savage	895
Periodic migrations of Irish agricultural laborers, Hooper	895
Suggestions concerning checking and tabulating farm management survey data	895
Lumber accounting in primary grain elevators, Humphrey and Kerr	896
Some extremes in Ohio soils, Thorne	896
Statistics of Ohio farms, Lutte	896
Monthly crop report	896
Agricultural statistics of Italy	896

## AGRICULTURAL EDUCATION.

The fighting chance for agriculture, Collett	896
Vocational training and liberal culture, Schmidt	897
Work for the improvement of rural education, Colegrove et al.	897
Recommendations for agricultural and household science departments	897
The best type of agricultural high school, Nelson	897
The Giblens schools, Broyles	898
Eighth report of the inspector of high schools, 1915, Heyward	898
The Royal Agricultural, Horticultural, and Forestry High School, Kamerling	898
Material and methods for teaching agriculture below the high school, Lewis	899
Home projects in secondary courses in agriculture, Barrows	899
Physical geography and soils, Green	899
Home economics instruction, de Diesbach	899
Extension course in vegetable foods, Barrows	899
Teaching of sewing, Buckman	899
Nature-study in the Genesee schools, Ill., Bailey	899
Intensive gardening, Sheppard	899
Boys' and girls' club work for 1916, Norcross	899

# LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

<i>Stations in the United States.</i>		<i>U. S. Department of Agriculture—Con.</i>	
Alabama College Station:	Page	Bul. 326, Birds of Porto Rico, A. Wetmore.....	Page 849
Bul. 187, Jan., 1916.....	833	Bul. 346, Home Projects in Secondary Courses in Agriculture, H. P. Barrows.....	899
Alabama Tuskegee Station:		Bul. 347, Methods for the Determination of the Physical Properties of Road-building Rock, F. H. Jackson, jr.....	890
Bul. 31, Mar., 1916.....	859	Bul. 349, The Raisin Industry, G. C. Husmann.....	835
Connecticut State Station:		Bul. 350, The Utilization of Cherry By-products, F. Rabak.....	808
Bul. 189, Dec., 1915.....	856	Bul. 353, Moisture Content and Shrinkage of Forage, H. N. Vinal and R. McKee.....	827
Florida Station:		Bul. 356, Milk and Cream Contests, E. Kelly, L. B. Cook, and J. A. Gamble.....	874
Bul. 129, Jan., 1916.....	831	Farmers' Bul. 699, Hydrocyanic-acid Gas Against Household Insects, L. O. Howard and C. H. Popenoe.....	854
Illinois Station:		Farmers' Bul. 709, Muscadine Grapes, G. C. Husmann and C. Dearing.....	834
Circ. 185, Feb., 1916.....	806	Farmers' Bul. 710, Bridge Grafting of Fruit Trees, W. F. Fletcher.....	833
Iowa Station:		Farmers' Bul. 711, The Care and Improvement of the Wood Lot, C. R. Tillotson.....	839
Research Bul. 23, July, 1915..	824	Farmers' Bul. 712, School Lunches, Caroline L. Hunt and Mabel Ward.....	861
Research Bul. 24, July, 1915..	811	Bureau of Crop Estimates:	
Circ. 24, Mar., 1916.....	836	Mo. Crop Rpt., vol. 2, No. 2, Feb. 29, 1916.....	896
Kansas Station:		Bureau of Soils:	
Bul. 207, Sept., 1915.....	809	Field Operations, 1914—	
Bul. 208, Sept., 1915.....	809	Soil Survey of Lee County, Iowa, L. V. Davis and M. E. Sar.....	809
Bul. 209, Dec., 1915.....	820	Soil Survey of Union County, N. C., B. B. Derrick and S. O. Perkins.....	810
Kentucky Station:		Soil Survey of Portage County, Ohio, C. N. Mooney and H. G. Lewis et al.....	810
Bul. 196, Dec. 31, 1915.....	822	Office of Farm Management:	
Bul. 197, Jan., 1916.....	871	Circ. 1, Suggestions Concerning Checking and Tabulating Farm Management Survey Data.....	895
Bul. 198, Jan., 1916.....	829		
Maine Station:			
Bul. 244, Dec., 1915.....	851		
Mississippi Station:			
Bul. 173, Jan. 1, 1916.....	830, 857		
New Jersey Stations:			
Bul. 279, May 20, 1915.....	832		
New York State Station:			
Tech. Bul. 48, Jan., 1916.....	802		
North Carolina Station:			
Bul. 235, Jan., 1916.....	872, 881		
Bul. 236, Feb., 1916.....	819		
North Dakota Station:			
Circ. 10, Jan., 1916.....	836		
Ohio Station:			
Mo. Bul., vol. 1, No. 3, Mar., 1916....	810, 830, 831, 851, 865, 896		
Tennessee Station:			
Bul. 114, Dec., 1915.....	867		
Texas Station:			
Bul. 182, Nov., 1915.....	866		
Bul. 183, Dec., 1915.....	816		
Wisconsin Station:			
Bul. 261, Feb., 1916.....	873		
Bul. 262, Feb., 1916.....	859		
<i>U. S. Department of Agriculture.</i>			
Journal of Agricultural Research, vol. 5:			
No. 22, Feb. 28, 1916....	829, 840, 845		
No. 23, Mar. 6, 1916.....	854, 881		
Bul. 123, Extension Course in Vegetable Foods, Anna Barrows.....	899		

<i>U. S. Department of Agriculture—Con.</i>		<i>U. S. Department of Agriculture—Con.</i>	
Office of Markets and Rural Organi- zation:	Page.	Scientific Contributions—Con.	Page.
Doc. 2, Lumber Accounting and Opening the Books in Primary Grain Elevators, J. R. Humphrey and W. H. Kerr.....	896	Five New Mammals from Mex- ico and Arizona, E. A. Gold- man.....	850
Office of the Solicitor:		Descriptions of a New Genus and Seven New Races of Flying Squirrels, A. H. Howell.....	850
Laws, Decisions, and Opinions Applicable to the National Forests.....	837	Five New Rice Rats of the Genus <i>Oryzomys</i> from Mid- dle America, E. A. Gold- man.....	850
Scientific Contributions: <sup>a</sup>		Orthoptera of the Yale-Dom- inican Expedition of 1913 A. N. Caudell.....	854
A Hydrogen Electrode Vessel, W. M. Clark.....	804	Genera of Subfamily Raphi- dophorinae Found North of Mexico, A. N. Caudell.....	854
The Decomposition of Tetra- thionates in Alkaline Solu- tion, R. M. Chapin.....	805	Descriptions of New Species and Genera of Lepidoptera from Mexico, H. G. Dyar....	855
A Comparison of Methods for the Determination of Soil Phosphorus, W. O. Robin- son.....	806	Lepidoptera of the Yale-Dom- inican Expedition of 1913, H. G. Dyar.....	855
Some New Methods for the Analysis of Lime-Sulphur Solutions, R. M. Chapin....	806	Report on the Lepidoptera of the Panama Canal Zone, H. G. Dyar.....	855
The Development of a Dyan- amic Theory of Soil Ferti- lity, F. K. Cameron.....	812	New Genera and Species of Microlepidoptera from Pan- ama, A. Busck.....	855
The Antizymotic Action of Salicylic Aldehyde and Man- nite, J. J. Skinner.....	815	The Noctuid Moths of the Genera <i>Palindia</i> and <i>Dyo- myx</i> , H. G. Dyar.....	855
Possible Sources of Potash in America, F. K. Cameron....	821	Two New Canadian Diptera, J. M. Aldrich.....	855
Plant Records of an Expedi- tion to Lower California, E. A. Goldman.....	827	New Western and Southwest- ern Muscoidea, C. H. T. Townsend.....	855
New or Noteworthy Plants from Colombia and Central America, V. H. Pittier.....	827	Diagnoses of New Genera of Muscoïd Flies Founded on Old Species, C. H. T. Town- send.....	855
The Necessity for Standardi- zation of Methods, E. Brown.	832	Two New Species of <i>Pipuncu- lus</i> , F. Knab.....	857
Apparatus and Methods Em- ployed in Making Purity Tests of Seeds, F. H. Hill- man.....	832	Notes on Some Virginian Spe- cies of <i>Platyptera</i> , N. Banks.	857
The Germination of Seeds Buried Ten Years, W. L. Goss.....	832	New Genera of Chalcidoid Hy- menoptera, A. A. Girault....	857
Features of the Grapefruit in California, A. D. Shamel....	835	Vespid and Sphecoid Hy- menoptera Collected in Gua- temala, S. A. Rohwer.....	857
Marketing of Woodlot Products in Kentucky, W. D. Ster- rett.....	839	Identification of Stages in Asexual Cycle of <i>Barltonella bacilliformis</i> , C. H. T. Town- send.....	858
Wood Flour, F. W. Kressmann.	839	Lambing Methods in National Forests of Southwest, R. R. Hill.....	868
Discovery of Chestnut Blight Parasite in Japan, C. L. Shear and N. F. Stevens....	848	Improved Management of Na- tional Forest Stock, W. C. Barnes.....	868
<i>Peridermium harknessii</i> and <i>Cronartium quercuum</i> , E. P. Meinecke.....	849	Vaccination Experiments Against Anthrax, A. Eich- horn.....	879
Peculiarity in Growth of Tail Feathers of the Giant Horn- bill, A. Wetmore.....	850		

<sup>a</sup> Printed in scientific and technical publications outside the Department.

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### RECENT WORK IN AGRICULTURAL SCIENCE.

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#### AGRICULTURAL CHEMISTRY—AGROTECHNY.

A handbook of colloid chemistry; the recognition of colloids, the theory of colloids, and their general physico-chemical properties, W. OSTWALD, trans. by M. H. FISCHER, R. E. OESPER, and L. BERMAN (*Philadelphia: P. Blakiston's Son & Co., 1915, pp. XII+278, pl. 1, figs. 60*).—This is the first English edition, translated from the third German edition of this work. It contains methods for general and special colloid analysis and a general theoretical consideration of the subject of colloid chemistry. Many references to original communications are cited in the text.

Industrial and manufacturing chemistry.—I, Organic, G. MARTIN ET AL. (*London: Crosby Lockwood & Son, 1915, 2. ed., rev. and enl., vol. 1, pp. XX+734, pls. 5, figs. 244*).—This is the second edition, revised and enlarged, of the work previously noted (*E. S. R., 30, p. 610*). The various sections have been brought up to date and new ones added on the hydrogenation of fats, the manufacture of milk sugar, the manufacture of maize and arrowroot starch, the analysis of rubber, and the new synthetic tanning materials. An index list of trade names of the newer synthetic drugs, photographic developers, etc., is appended.

Supplement to Muspratt's encyclopedia of technical chemistry.—Technology of the organic chemical industries, edited by A. BRIZ (*Ergänzungswerk zu Muspratt's Enzyklopädischem Handbuch der Technischen Chemie.—Chemische Technologie Organischer Industriezweige. Brunswick: F. Vieweg & Son, 1915, vol. 3, 1. half, pp. XIV+515, figs. 51*).—This is the first part of the third supplementary volume to the original work. The general subjects considered are ether, drugs and sera, celluloid, cellulose, the use of cellulose esters for films, disinfection, protein, protein preparations, noninflammable solvents and extraction agents, natural dyestuffs, intermediate products of the coal-tar dye industry, coal-tar dyes, pigments, the determination, testing, and value of coal-tar dyes, and varnishes, siccatives, and lacs.

Supplement to Muspratt's encyclopedia of technical chemistry.—The chemical technology of fermentation and food stuffs, edited by F. HAYDUCK (*Ergänzungswerk zu Muspratt's Enzyklopädischem Handbuch der Technischen Chemie.—Chemische Technologie der Gärungs- und Nahrungsmittel. Brunswick: F. Vieweg & Son, 1915, vol. 4, 1. half, pp. XI+516, figs. 341*).—This is the first part of the fourth supplementary volume to the original work. The subjects considered are alcohol and compressed yeast, beer, bread, butyric acid, vinegar, and the tanning industry.

**Chemical changes in the souring of milk,** L. L. VAN SLYKE and A. W. BOWORTH (*New York State Sta. Tech. Bul.* 43 (1916), pp. 124 *Jour. Biol. Chem.*, 24 (1916), No. 3, pp. 191-202).—The results of the investigation reported demonstrate that about 22 per cent of the lactose of milk is changed by the lactic acid bacteria during the process of souring. Of this amount about 88.5 per cent is converted into lactic acid. The citric acid present in the milk completely disappears, being decomposed into acetic acid and carbon dioxide by *Bacterium lactis aerogenes*. The insoluble inorganic constituents of normal milk are made soluble by the acid resulting from bacterial action. The albumin which in normal milk only partly passes through a porous porcelain filter is so changed in some manner during the souring as to pass completely through such a filter. The calcium caseinate of normal milk is completely converted into free protein and precipitated as such, the calcium forming calcium lactate which is soluble in the serum.

The rate and extent of chemical change under given conditions was also studied. The greatest change of conversion of milk sugar into lactic acid was found to occur between the tenth and the twenty-fourth hour after inoculation. The acidity increased rapidly during the first 24 hours, the rate of increase diminishing after this time. The amount of albumin nitrogen in milk serum was found to increase with the increase of acidity. All of the albumin of the milk appeared in the serum in 14 hours.

The experimental methods used in the investigation were those described in the bulletin previously noted (*E. S. R.*, 32, p. 607).

**Chemical changes occurring during the ripening of the wild goose plum,** J. S. MCHARGUE (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 718-722).—From the results of a study at the Kentucky Experiment Station the author concludes that there is a gradual diminution in the acidity of the fruit during the ripening period, and at the same time an increase in the amount of reducing sugars formed. The greatest increase in total sugars occurs in passing from the unripe to the ripe condition. Saccharose plays a very important part in the ripening of this fruit, which suggests the idea that a fruit is just ripe when it contains the maximum amount of saccharose. This plum contains the enzyme invertase, which is apparently most active in the passage of the fruit from the ripe to the overripe stage.

**The essential oil of sugi (*Cryptomeria japonica*) leaves,** S. UCHIDA (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 687-699).—The sugi is a coniferous tree indigenous to Japan, and extensively cultivated as a valuable timber. The essential oil of the leaves, obtained by steam distillation, was found to contain the following substances: *d*- $\alpha$ -pinene; dipentene; an alcohol ( $C_{15}H_{26}O$ , b. p.=212-214°,  $d_{20}^{25}=0.9414$ ,  $n_D^{25}=1.4832$ ); cadinene; a sesquiterpene with two double linkings ( $C_{15}H_{24}$ , b. p.=266-268°,  $d_{20}^{25}=0.9335$ ,  $n_D^{25}=1.5041$ ,  $[\alpha]_D^{25}=+15.19^\circ$  in a 6.08 per cent chloroform solution); a sesquiterpene alcohol ( $C_{15}H_{26}O$ , b. p.=234-236°,  $d_{20}^{25}=0.9623$ ,  $n_D^{25}=1.5048$ ,  $[\alpha]_D^{25}=+16.76^\circ$  in a 5 per cent chloroform solution); a new diterpene ( $C_{20}H_{32}$ , b. p.<sub>760</sub>=345°, b. p.<sub>760</sub>=198,  $[\alpha]_D^{25}=-34.22^\circ$  in a 4.67 per cent chloroform solution) for which the author proposes the name " $\alpha$ -cryptomerene"; a lactone ( $C_{20}H_{32}O_2$ ); euprylic acid in combination with the alcohol; higher fatty acids in a free state; and a blue oil "azulene."

The relative proportion of the above constituents present was also determined.

**Essential oil of Formosan hinoki (*Chamaecyparis obtusa*) wood,** S. UCHIDA (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 699-702).—The hinoki tree is extensively grown in Japan and furnishes a timber wood of superior quality. The crude oil obtained by dry distillation of the wood was rectified by steam

distillation and found to consist chiefly of *d*- $\alpha$ -pinene and cadinene, with a small amount of oxygenated compounds. The amount of terpenes was about 70 per cent and of sesquiterpenes about 24 per cent.

**The thermal values of the fats and oils.**—I, The heat of bromination, J. W. MARDEN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 121–126, figs. 3).—A special apparatus and method for the determination of the true heat of bromination, and also a new apparatus for the rapid determination of specific heat, are described. Experimental data indicate that the heat of bromination is not directly comparable to the iodine number. The heats of solution of bromine and most oils in carbon tetrachloride were found to be very small.

**The action of bromine on proteins and amino acids,** M. SIEGFRIED and H. REPPIN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 1, pp. 18–28).—Experimental data on the absorption of bromine by proteins and amino acids are submitted.

It is indicated that in a mixture of protein cleavage products only amino acids containing a ring complex absorb bromine. Gelatin and edestin absorb more bromine than their cleavage products. The significance of the results obtained is discussed.

**On the chemical constitution of the proteins of wheat flour and its relation to baking strength,** M. J. BLISH (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 138–144).—As the result of his investigation the author concludes that the individual proteins of both strong and weak flours are identical in their chemical constitution as determined by the Van Slyke method (E. S. R., 26, p. 22). The gliadin-glutenin ratio is more constant in flours of different baking qualities than has been indicated by previous investigators, the great variation being in the "soluble proteins." The determination of ammonia nitrogen in the hydrolyzed products of flour, extracts of flour made with various solvents, and crude gluten is proposed to serve as an accurate indication of the amounts of the various proteins present in the flour.

**The refractive indices of solutions of certain proteins.**—IX, Edestin, C. L. A. SCHMIDT (*Jour. Biol. Chem.*, 23 (1915), No. 2, pp. 487–493).—Experimental data of the refractive indices of varying amounts of edestin, dissolved in various concentrations of solutions of acids, bases, and salts, are submitted.

The solutions were found to follow the law  $n-n_0=a \times c$  (E. S. R., 25, p. 709), the average value for *a* being  $0.00174 \pm 0.00006$ . The value for *a* remained constant, even though the solvent caused hydrolysis of the dissolved protein.

**The preparation of glucosamin hydrochloride from mucoid obtained from the ascitic fluid,** A. OSWALD (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2–3, pp. 100, 101).—On boiling the mucoid obtained from the ascitic fluid with 3 per cent hydrochloric acid, filtering, and concentrating the filtrate, the characteristic crystals of glucosamin hydrochloride were obtained and easily identified.

**Enzyme investigations.**—X, Experiments on the enzymatic synthesis of disaccharides, W. LÖB (*Biochem. Ztschr.*, 72 (1916), No. 5–6, pp. 392–415).—From the investigation reported the author concludes that the invertase of sugar beets, as well as that of yeast and pancreas, is unable, under the experimental conditions described, to synthesize cane sugar from its corresponding hexoses.

**The influence of certain substances on the activity of invertase,** E. G. GRIFFIN and J. M. NELSON (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 722–739).—Experimental data submitted indicate that the inhibiting effect on enzyme activity of certain substances, such as glass beads, serum, and egg albumin, is due to a lowering of the hydrogen ion concentration. The effect of

charcoal was also found to be due to a change in the hydrogen ion concentration. Relatively large amounts of this material, however, were found to absorb invertase from solution. Gelatinous aluminum hydroxid was also found to possess this adsorbing power, but in small amounts it did not interfere with the activity of the enzyme.

**The occurrence of arginase in the animal organism and its determination by the formol titration procedure.** S. EDERACHER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 81-87).—From his investigation the author concludes that the Sørensen formol titration method is a convenient and reliable procedure for the determination of arginase. Arginase was found in the liver of guinea pigs and rabbits, but was absent from this organ in birds and reptiles. Its presence in the kidneys, thymus, and intestinal mucosa of birds, as reported by Kossel and Dakin,<sup>a</sup> could not be determined by the method followed.

**A hydrogen electrode vessel.** W. M. CLARK (*Jour. Biol. Chem.*, 23 (1915), No. 2, pp. 475-486, fig. 1).—The author describes a form of apparatus devised to meet some special requirements in a study of the hydrogen ion concentrations of bacterial cultures. The accuracy of the results obtained with the apparatus is indicated by experimental data.

**Simple sodium lamp for polariscope.** G. K. FORESMAN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, p. 165).—The device consists of a piece of fire and acid proof asbestos with a slit of the proper size cut in, and is used in connection with an ordinary Bunsen burner with a wing top. By saturating the edges of the slit with salt solution a flame of great intensity is produced. The asbestos does not affect the quality of the sodium flame.

**A large fat extractor.** C. L. A. SCHMIDT (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, p. 165, fig. 1).—A large apparatus in which several pounds of material may be extracted in a single operation is described and illustrated by a figure. It consists essentially of two parts, a large distilling flask and the extractor proper, which is made of heavy glass. To insure ether-tight seals mercury is used at all the connections. The apparatus may be used for the recovery of the solvent used in the extraction.

**Soda lime as an energetic general reagent and its great chemical activity.** I. GUARESCHI (*Abs. in Chem. Abs.*, 10 (1916), No. 1, p. 25).—A review of the literature of soda lime is given and its history and uses discussed in detail.

Experimental data indicate that soda lime is an excellent absorbent for chlorine, bromine, hydrochloric acid, hydrobromic acid, nitrogen peroxid, and carbonyl chlorid. The freshly prepared reagent absorbs from 80 to 90 cc. of carbon dioxide in 10 minutes. When prepared from calcium oxid and a solution of sodium hydroxid it was found to be a better absorbent for carbon dioxide than solid potassium hydroxid. Carbon monoxid, pyrrol, indol, aldehydes, ethyl bromoacetate, benzyl bromid, chloroacetone, and a number of ethers and nitriles were found to be more or less completely absorbed.

The author concludes that soda lime probably is not a simple mixture but a definite compound, and proposes formulas. With traces of iron, manganese, etc., it is considered superior to the chemically pure material as an absorbent since these substances act as catalysts.

**A rapid method of converting scrap platinum into chloroplatinic acid.** J. B. and A. TINGLE (*Jour. Soc. Chem. Indus.*, 35 (1916), No. 2, p. 77).—A method in which the platinum is alloyed with zinc by fusion under a layer of borax or other flux is described. The metallic mass which results from the fusion is treated with dilute commercial hydrochloric acid. The zinc dissolves rapidly

<sup>a</sup> Hoppe-Seyler's Ztschr., Physiol. Chem., 42 (1904), No. 3, p. 184.

and leaves behind a black powder resembling platinum black. This is dissolved in aqua regia, the resulting solution evaporated to dryness, and the residue redissolved in very dilute hydrochloric acid. From this solution the platinum is separated either by precipitating the metal with zinc or by precipitating with hydrogen sulphid, filtering, washing, and igniting the resulting sulphid. The platinum thus obtained is readily soluble in aqua regia, and easily converted into chloroplatinic acid in the usual manner.

**A possible source of error in colorimeter observations,** J. H. LONG (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 716-718).—The author reports certain discrepancies in colorimeter observations which resulted from using an instrument which had stood through a hot summer in a room the temperature of which often reached 33° C. (91.4° F.). At this temperature the wax by which the prisms are fastened in their brass sockets becomes soft enough to permit the slow displacement of the glass. Care should therefore be exercised to keep instruments away from the vicinity of steam radiators and from places which are likely to become very warm in summer.

**An evaluation of the methods for the determination of phosphoric acids soluble in citric acid and that found in dephosphorization slags** (Thomas slag), O. SICHMANN (*Zhur. Opytn. Agron.*, 16 (1915), No. 3, pp. 169-212).—As the result of a critical comparison the author has found very little difference between the molybdc method, the methods of Lorenz (E. S. R., 13, p. 14), Popp (E. S. R., 29, p. 410), Darmstadt, and Naumann (E. S. R., 14, p. 940), and the hydrochloric acid method. The Lorenz method gave the lowest results. For convenience and rapidity the methods of Popp and Lorenz are recommended, the latter being the simpler.

**Easily extractable phosphorus and phosphorus nutrition,** I. JAKOUCHKINE (*Zhur. Opytn. Agron.*, 16 (1915), No. 2, pp. 118-139).—The author has shown that for material poor in fat, such as stems or stalks, the alcohol and ether extraction does not cause an appreciable decrease of phosphorus pentoxid in the acid extract. Direct precipitation in citric acid was used in separating the mineral phosphate from the phytin. More exact results may be obtained by using this method in combination with that of Iwanoff by first precipitating with magnesia mixture in the presence of citric acid, and, after dissolving in nitric acid, reprecipitating by Neumann's method.

The amount of phytin in the grain is apparently dependent on the condition of the soil. The fertility of the soil is indicated by the mineral-phosphate content of the straw, and when the content is less than from 0.07 to 0.1 per cent a phosphate fertilizer is deemed necessary, while a mineral-phosphate content greater than 0.15 per cent shows that the soil is sufficiently rich in phosphorus.

**The decomposition of tetrathionates in alkaline solution as a source of error in certain iodine titrations,** R. M. CHAPIN (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 625, 626).—The experimental data reported indicate that "tetrathionates are notably sensitive to even low concentrations of hydroxyl ions, though only slightly affected by sodium bicarbonate, and still less by sodium bicarbonate in presence of carbonic acid. It therefore follows that acid solutions containing tetrathionates, if to be later titrated with iodine or subjected to any treatment involving assumption that the tetrathionate present has remained unaffected, should never be neutralized by any substance of distinctly alkaline properties." Sodium carbonate, however, may be used within reasonable limits of error, provided the solution is not subjected to an elevated temperature for any length of time. Sodium sulphite is recommended as a discharging agent for iodine in place of sodium thiosulphate.

**Report of the session of the International Commission for Chemical Soil Analysis; Munich, April 23 and 24, 1914** (*Internat. Mitt. Bodenk.*, 5 (1915), Nos. 1, pp. 25-52; 2, pp. 127-153).—This is an account of the proceedings of the commission, including discussions of chemical methods for soil analysis.

**The application of potassium permanganate for the determination of humus in soils.** P. GRIGORIEFF (*Zhur. Opytn. Agron.*, 16 (1915), No. 3, pp. 217-222).—The probable nature of the oxidation of the humus in soil by potassium permanganate is considered. The results obtained by the oxidation method do not agree with those obtained by Gustavsohn's method, the former method yielding too high results. For this reason it is concluded that the oxidation method, although simple and rapid, is not to be preferred to the combustion method.

**On the distribution and composition of the humus of the loess soils of the transition region.** M. J. BLISH (*Univ. [Nebr.] Studies*, 14 (1914), No. 2, pp. 111-144).—From a long series of experiments on Nebraska soils the author concludes that the Rather method (*E. S. R.*, 20, p. 406) for humus determinations is the most practical of all gravimetric methods tried. For the determination of humus nitrogen the Alway-Bishop procedure was found to be the most satisfactory, both in point of accuracy and economy of time.

Soil color may be associated fairly closely with humus content when the soils under inspection are from the same locality. A reliable comparison, however, can not be made with soils from different localities on account of the presence of substances other than humus, such as lime and iron. The photometric determination was not found to give satisfactory results with soils containing less than 0.1 per cent of humus. Great variation in the humus content of the soils was found with respect to both locality and depth from which the samples were taken.

**A comparison of methods for the determination of soil phosphorus.** W. O. ROBINSON (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 148-151).—The results of the author's investigation indicate that accurate determinations can be obtained by the fusion, Washington, and Fischer methods of treating the soil for phosphorus determinations. Vanadium interferes with the volumetric phosphorus determinations in soils, but the difficulty was overcome by reducing the vanadium with ferrous sulphate and precipitating the phosphorus at a low temperature by agitation. Tungsten and titanium were not found to interfere with the phosphorus determinations by the gravimetric method when proper precautions for complete precipitation were exercised.

**A limestone tester.** C. G. HOPKINS (*Illinois Sta. Circ.* 185 (1916), pp. 2-12, figs. 2).—This circular describes in detail a simple apparatus and method for the determination of calcium carbonate in limestones used for agricultural purposes, similar to and based on the same principle as the "calcimeter" previously noted (*E. S. R.*, 34, p. 503).

The final result can not be ascertained by direct reading but involves a simple calculation. Tables of the weight of carbon dioxide in milligrams per cubic centimeter at various temperatures and pressures are included.

The apparatus may also be used for determining the limestone content of soils.

**Some new methods for the analysis of lime-sulphur solutions.** R. M. CHAPIN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 151-156).—New methods based on definite reactions are described in detail. Some of the procedures are applicable to polluted dipping baths through which sheep and cattle have passed.

**On the detection and determination of halogens in organic compounds.** I. DROGIN and M. A. ROSANOFF (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp.

711-716).—An improvement of the method described by Stepanoff<sup>a</sup> and modified by others is outlined in detail.

The method consists in dissolving the halogen compound in 98 per cent alcohol, adding an excess of sodium and, after sufficient heating, diluting the mixture with water. The alcohol is then distilled off, the solution acidified with nitric acid, and the free halogen acid, thus produced, titrated according to Volhard's method. Experimental data submitted indicate the accuracy of the method. The qualitative procedure was found to yield a decided positive test in certain cases where the Beilstein test gave a doubtful result.

**A method for the estimation of chlorids in cheese,** ELFREIDA C. V. CORNISH and J. GOLDING (*Analyst*, 40 (1915), No. 470, pp. 197-203, fig. 1; *abs. in Ztschr. Angew. Chem.*, 29 (1916), No. 2, Referatenteil, p. 4).—A method claimed to be more accurate and rapid than the incineration or water-extraction method is described.

The sample is treated in a Kjeldahl flask with concentrated sulphuric acid and gently heated. By means of a specially arranged apparatus the hydrochloric acid formed by the action of the sulphuric acid on the chlorids present is aspirated into standard acid silver nitrate and precipitated as silver chlorid. When the reaction is complete the silver chlorid is filtered, washed free of nitrates, the washings added to the filtrate, and the excess of silver nitrate in the filtrate determined according to Volhard's method. Experimental data, obtained from different samples of normal cheese and others showing a brown discoloration are submitted.

The cheese residue remaining in the flask after the distillation of the hydrochloric acid may be used for the estimation of nitrogen in the solid cheese, by Kjeldahl's method.

**The determination of acidity in potatoes,** J. F. HOFFMANN and F. PRECKEL (*Landw. Vers. Stat.*, 87 (1915), No. 2-3, pp. 237-239).—The following procedure is recommended by the authors:

Fifty cc. of the pressed juice is measured into a 250 cc. flask, and 95 per cent alcohol added to the mark. The mixture is allowed to set for about one hour with occasional shaking and then filtered. For the titration 100 cc. of the filtrate is diluted with an equal volume of water and 1 cc. of rosolic acid added. The liquid thus contains about 80 cc. of alcohol and 120 cc. of water. A comparison solution is prepared in a similar manner with 80 cc. of alcohol and 120 cc. of water and titrated to a definite color change. The potato sample is titrated to the same shade and the reading of the comparison solution subtracted from that of the potato sample. The liquids should be well shaken before titrating in order to remove as much as possible of the carbon dioxide, which influences the color change.

**The analysis of maple products.—V, Miscellaneous observations on maple sirup incidental to a search for new methods of detecting adulteration,** J. F. SNELL (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 144-148).—Certain observations made while working on new methods for the detection of adulteration are recorded. A complete ash analysis of a composite of about 60 genuine sirups indicated the presence of more chlorin and less phosphoric acid than the analyses previously recorded.

See also previous notes (E. S. R., 32, p. 808; 33, pp. 15, 208).

**The determination of small amounts of sugar in urine,** S. NAGASAKI (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 61-77).—For determining small amounts of sugar in urine the author has devised a method as follows:

<sup>a</sup> Ber. Deut. Chem. Gesell., 39 (1906), No. 16, pp. 4056, 4057.

The sample is first titrated with Benedict's copper solution (E. S. R., 25, p. 15). Another sample is then inoculated with the yeast *Torula monosa* and allowed to ferment for 24 hours at 30° C. After the fermentation the sample is again titrated with Benedict's solution and the amount of glucose calculated from the difference in the two titrations. By boiling the fermented urine with citric acid and repeating the fermentation and titrations as before, the isomaltose, calculated as glucose, can be easily determined. Samples in which spontaneous fermentation has started do not give reliable results.

The method is deemed of value in determining the slight influence of a diet in cases of glycosuria, and in making a diagnosis of doubtful cases of diabetes. The average glucose content of 174 samples of normal urine was found to be 0.012 per cent (maximum 0.033, minimum 0.002 per cent), and the average percentage of isomaltose in 84 samples was found to be 0.012 per cent (maximum 0.023, minimum 0.003 per cent).

The determination of amino acids in urine, I. BANG (*Biochem. Ztschr.*, 72 (1915), No. 1-2, pp. 101-103).—To obviate the inconvenience of titrating a colored solution in the formal titration method for the determination of amino-acid nitrogen the author recommends that the solution be decolorized with blood charcoal in the presence of 20 per cent alcohol. No amino-acid nitrogen is lost by this procedure.

New indican reaction, A. JOLLES (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 1, pp. 29-33).—The following procedure is recommended as a qualitative test for indican:

Ten cc. of urine is mixed with 1 cc. of a 5 per cent alcoholic solution of  $\alpha$ -naphthol and 10 cc. concentrated hydrochloric acid (containing 5 gm. ferric chloride per liter). The mixture is thoroughly shaken and allowed to set for 15 minutes, after which the coloring matter is extracted with 5 cc. of chloroform. The color of the extract will vary from violet to a dark blue, depending on the amount of indican present. The reaction is sensitive to 0.003 mg. indican in 10 cc. of liquid, but is not applicable to quantitative colorimetric determinations.

The nephelometric determination of small amounts of essential oils, A. G. WOODMAN, R. T. GOOKIN, and L. J. HEATH (*Jour. Indust. and Engin. Chem.*, 8 (1916), No. 2, pp. 128-131, figs. 2).—A procedure based on the formation of an emulsion on adding water to an alcoholic solution of an essential oil, using the Kober nephelometer previously noted (E. S. R., 31, p. 114), is described. Great accuracy is said to be possible with the method in concentrations up to 1 per cent and, by suitable dilution with alcohol, in higher concentrations. In applying the method to cordials the percentage of alcohol and sugar influences the results to such an extent that it is necessary to use a standard containing approximately the same amounts of these materials. If the cordials are deeply colored the alcohol may be distilled off and the distillate compared with a standard extract.

The utilization of cherry by-products, F. RABAK (*U. S. Dept. Agr. Bul.* 359 (1916), pp. 24).—As a result of the investigation the author obtained from the pits of red sour cherries a fixed oil, the physical and chemical properties of which were found to be very similar to those of the commercial oil of almonds. It is indicated that this oil should find application along pharmaceutical and therapeutical lines, as a condimental oil, or in the soap-making industry. The volatile oil produced from the press cake is practically identical with the oil of bitter almonds, and would thus find the same application. Analysis of the meal, which is the final residue, showed 1.06 per cent of moisture, 30.87 per cent of protein, 13.1 per cent of ether extract, 42.13 per cent of nitrogen-free

extract, 8.9 per cent of crude fiber, and 3.94 per cent of ash. From the juice alcohol, sirup, and jelly have been successfully prepared.

### SOILS—FERTILIZERS.

**Soil survey of Lee County, Iowa,** L. V. DAVIS and M. E. SAR (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 36, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station and issued March 10, 1916, deals with the soils of an area of 327,040 acres in southeastern Iowa.

• “The county comprises two main physiographic divisions. The upland plateau, with level to rolling topography, constitutes one division, and the alluvial river terraces and first bottoms the other. The former occupies about six-sevenths of the total area of the county.” The soils of the county are of loessial, glacial, residual, and alluvial origin. Nineteen\* soil types of nine series are mapped, of which the Grundy silt loam, the Lindley loam, the Putnam silt loam, and the Memphis silt loam cover respectively 27.5, 23.7, 11.4, and 10 per cent of the area.

**Soil survey of Cherokee County, Kansas,** P. O. WOOD and R. I. THROCKMORTON (*Kansas Sta. Bul. 207 (1915), pp. 46, pl. 1*).—This survey, made in cooperation with the Bureau of Soils of this Department and noted in the Field Operations of that Bureau for 1912 (*E. S. R., 34, p. 322*), deals with the general characteristics, mechanical and chemical composition, and crop adaptabilities of the soils of an area of 374,400 acres in southeastern Kansas, consisting mainly of residual prairie.

The soils are residual upland soils and alluvial bottom soils. Including meadow, 22 soil types of 13 series are mapped, of which the Bates silt loam and the Cherokee silt loam cover 24.5 and 20 per cent of the area, respectively. Chemical analyses of samples of the types are reported, the results of which are taken to indicate that these soils are relatively deficient in nitrogen, phosphorus, potassium, and lime, and high in organic matter. The majority of the soils are acid.

A fertilizer test with wheat is included.

**Soil survey of Reno County, Kansas,** W. T. CARTER, JR., ET AL. (*Kansas Sta. Bul. 208 (1915), pp. 48, pl. 1*).—This survey, made in cooperation with the Bureau of Soils of this Department and noted in the Field Operations of that Bureau for 1911 (*E. S. R., 31, p. 513*), deals with the general characteristics, mechanical and chemical properties, and crop adaptabilities of the soils of an area of 812,000 acres in south-central Kansas, the general topography of which is that of a rolling plain intersected by three relatively narrow valleys.

The soils of the area are upland and bottom soils and are formed (1) from loess and sandstones, (2) from unconsolidated water-laid deposits, (3) from a mixture of the above two groups, and (4) from wind-laid deposits. Including meadow and dune sand, 31 soil types of 10 series are recognized, of which the Pratt loam and fine sandy loam and the Albion sandy loam cover 16.6, 15.1, and 11.1 per cent of the area, respectively. Chemical analyses of representative samples of each type made at the station are reported, the results of which show that the nitrogen content averages 0.106 per cent for the surface soil, 0.076 per cent for the subsurface soil, and 0.045 per cent for the subsoil, and the phosphorus content averages 0.034 per cent for the surface and subsurface soil and 0.031 per cent for the subsoil. The potash and lime contents are considered to be relatively high, most of the soils containing more than 2 per cent potassium. The average calcium content for the county was 1.88 per cent in the soil, 1.47 in the subsurface soil, and 1.73 in the subsoil.

**Soil survey of Union County, North Carolina, B. B. DERRICK and S. O. PERKINS** (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and issued March 4, 1916, deals with the soils of an area of 403,200 acres in southern North Carolina.

"The general surface features of Union County consist of broad, gently rolling interstream areas, which become more rolling, broken, and hilly as the larger streams are approached. The central, eastern, and northern portions of the county slope to the northeast and are well drained by the Rocky River and its tributaries, while the remainder inclines toward the southwest, being drained by tributaries of the Catawba River." The county lies wholly within the Piedmont Plateau province and the soils are of residual origin. Sixteen soil types of 8 series are mapped, of which the Alamance silt loam and gravelly silt loam cover 24.7 and 16.9 per cent of the area, respectively, and the Georgeville gravelly silt loam and silt loam 15.5 and 13.9 per cent, respectively.

**Soil survey of Portage County, Ohio, C. N. MOONEY, H. G. LEWIS, A. F. HEAD, and C. W. SHIFFLER** (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 44, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Agricultural Experiment Station and issued March 4, 1916, deals with the soils of an area of 333,440 acres in northeastern Ohio, the topography of which ranges from flat or slightly undulating to rolling and hilly. The soils are of glacial and alluvial origin. Including muck, 18 soil types of 10 series are mapped, of which the Volusia clay loam, loam, and silty clay loam cover 27.4, 25.1, and 10.1 per cent of the area, respectively, and the Wooster loam 18.1 per cent.

**Analyses of typical soils, J. W. AMES** (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 73-76*).—Results selected from a number of analyses of representative soils from various localities in Ohio are reported in the following table for the purpose of indicating the variations in amounts of fertility constituents that may exist in different classes of soil:

*Fertility constituents in different classes of soil, per acre.*

Type of soil.	Depth.	Nitrogen.	Phosphorus.	Potassium.	Calcium.	Macronutrient.
	Inches.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
Sand.....	0-7	1,000	892	20,000	9,038	4,460
Sandy loam.....	0-7	2,390	782	28,772	12,302	5,128
Do.....	7-15	590	282	30,656	11,912	5,128
Silt loam.....	0-7	2,096	870	29,062	4,758	2,584
Do.....	7-15	1,054	608	31,278	2,986	2,584
Clay loam.....	0-7	2,928	766	31,331	7,560	8,402
Do.....	7-15	1,152	388	25,088	7,092	9,400
Clay.....	0-7	2,170	690	42,384	5,618	12,000
Do.....	7-15	910	428	44,890	3,720	15,000
Black clay loam.....	0-7	4,900	1,456	41,806	15,304	14,184
Do.....	7-15	2,100	788	46,872	14,180	17,000
Black clay.....	0-7	7,440	1,958	46,786	18,856	14,184
Do.....	7-15	3,800	1,446	52,600	16,050	15,176
Peat.....		27,860	1,710	3,370	2,000	2,400

**Geo-agronomic study of the farm lands of the Royal Institute of Experimental Agriculture in Perugia, B. MARCARELLI** (*Staz. Sper. Agr. Ital., 4 (1915), No. 4, pp. 233-271, pls. 4*).—This is a detailed description of the topography, geology, origin, and characteristics of the soils and of the meteorological and agricultural conditions of the farm lands of the institute and includes mechanical and chemical analyses of the soils.

Soils study according to the geological-agronomic survey, with especial reference to the soils types of the lower Rhine districts, E. ZIMMERMAN (Fähling's Landw. Ztg., 64 (1915), No. 13-14, pp. 329-347).—This is a general discussion of the methods, results, and advantages of this kind of soil survey as applied to the lower Rhine districts.

Successful soil-sampling tools, A. M. SHAW (Engin. News, 74 (1915), No. 26, p. 1228, fig. 1).—A soil-sampling outfit consisting of an auger and pipe extension for taking deep samples is described.

Recent brown soil and humus formation in Java and the Malay Peninsula, together with remarks on climatic weathering, R. LANG (Centbl. Min., Geol. u. Paläontol., 1914, Nos. 17, pp. 513-518; 18, pp. 545-551; abs. in Zentbl. Agr. Chem., 44 (1915), No. 4-5, pp. 148-150).—The author reports the results of observations on the occurrence and origin of the so-called brown soils and humus soil of Java and the Malay Peninsula and the influence of climatic factors on their formation.

It is concluded that the main factor in the formation of both these soils is an extraordinarily heavy rainfall. Brown soils are formed when the waters of a tropical region are so impregnated with mineral salts as to effect an adsorptive saturation of the soil humus substances with which they come in contact.

Raw humus is formed where the waters of tropical regions do not contain sufficient mineral salts to effect an adsorptive saturation of humus substances. It is further concluded that dampness and coolness favor humus formation, while heat and dryness retard it.

Determination of amino acids and nitrates in soils, R. S. PORTER and R. S. SNYDER (Iowa Sta. Research Bul. 24 (1915), pp. 327-352, figs. 3).—This bulletin briefly reviews the work of others bearing on the subject and reports the details of the experiments noted below and of experiments previously noted from another source (E. S. R., 34, p. 112).

The amino acid nitrogen of soil, R. S. PORTER and R. S. SNYDER (Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1049-1053, figs. 3).—Laboratory and pot experiments are reported in which it was found that by use of the Kober copper method of determining amino acids (E. S. R., 31, p. 211) no amino acid nitrogen could be detected in the dilute acid extract of soils. Upon adding small quantities of amino acid to a soil and extracting with dilute acids no amino acid was found. "Upon adding small quantities of amino acids to a soil and extracting with dilute alkali, practically the entire amount added was recovered. There was found to be no difference in the quantity of amino acid nitrogen extracted by dilute alkali in one, two, four, and six hours."

From the pot experiments it is concluded that "there is no tendency for amino acid to accumulate . . . in a limed and unlimed acid soil, in a heavily manured and limed, and a heavily manured unlimed acid soil. The amino acid nitrogen was present in the soil in less amounts than the ammonia nitrogen, but in a general way it fluctuates with the ammonia nitrogen. The soils with the higher amounts of manure show a decided decrease in the amount of nitrate nitrogen at first, but after from four to six weeks there is a decided increase."

The origin of the "niter spots" in certain western soils, W. G. SACKETT and R. M. ISHAM (Science, n. ser., 42 (1915), No. 1083, pp. 452, 453).—The authors disagree with the theory of Stewart and Peterson (E. S. R., 33, p. 121) with reference to the cause of the brown coloration of the so-called niter spots in some western soils, and adhere to the theory of pigmentation of *Acetobacter*

*chromococcum* as the cause of the brown coloration of the spots (E. S. R., 25, p. 815).

The origin of the "niter spots" in certain western soils, R. STEWART and W. PETERSON (*Science*, n. ser., 43 (1916), No. 1097, pp. 20-24).—This is a reply to the above, in which the authors reiterate their original theory regarding the origin of the brown niter spots (E. S. R., 33, p. 121). They conclude "that the nonsymbiotic bacteria are not responsible for the production of the nitrates noted in the niter spots of the affected soils of the arid West and their presence there is only incidental and of no more economic importance than their more abundant occurrence in other normal niter-free soils of the arid regions. The nitrates present in the niter spots are the direct result of the leaching and concentrating action of the ground water upon the nitrates preexisting in the country rock adjacent to or underneath the soil of the affected area. . . . The color is due to the solvent and decomposing action of the nitrates upon the old organic matter or humus in the soil." Experimental data are cited in support of the argument.

The variation of the fertility and productivity of the soil under the influence of natural conditions and dry air storage, K. GEDMOITS (*Trudy Selsk. Khoz. Khim. Lab. St. Peterb.*, 8 (1914), pp. 144-199; *abs. in Selsk. Khoz. i L'isov.*, 245 (1914), Aug., pp. 630-633; *Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 15 (1914), No. 4, pp. 307, 308; *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 1, pp. 37-39).—Pot experiments with oats and flax on soils stored in dry air from one to six years following 1903 are reported, in which no fertilization, complete fertilization, complete fertilization without nitrogen, and complete fertilization without phosphoric acid were practiced.

A gradual increase in the oat crop without fertilizer with length of storage was observed, except in the fifth year of storage. "The same effect also occurred in the pots without nitrogen and without phosphate. With the complete fertilizer the greatest yield was obtained in the first year; there was then a considerable decrease in the second year, followed by a gradual increase, though the yield of the first year was never reached. In the case of flax with a complete fertilizer the harvest increased regularly during the four years after the first year, then remained almost constant. With the other series the changes corresponded to those of the oats."

As a check on the above experiments a series was conducted in which soils collected in various years were all tested in the same year (1908). "These experiments and many others carried out during a period of years show that the yield is always in direct relation with the length of storage of the soil. Chemical analysis shows a slight increase in the percentage of phosphoric acid soluble in 2 per cent citric acid and in acetic acid. In 1904 the citric acid soluble phosphoric acid was 0.0078 per cent and in 1909 the same soil gave 0.0096 per cent. The percentage of phosphoric acid in the oats and flax was also increased with the duration of storage of the soil. . . . Chemical analysis showed similar results with respect to nitrogen. . . .

"These results lead to the conclusion that storing the soil in dry air increases its productivity in proportion to the period of storage, and also increases in a corresponding degree the percentage of phosphoric acid and nitrogen in the crop."

The development of a dynamic theory of soil fertility, F. K. CAMERON (*Jour. Franklin Inst.*, 181 (1916), No. 1, pp. 27-49, figs. 2).—The author reviews some of the more important features of the existing knowledge of soil fertility and points out that soil management involves the consideration of

all the natural factors affecting the same, singly and in total, and that each of these factors is in a continual process of change. "The problems of soil management are, therefore, essentially dynamic. . . . The properties of the soil are not merely the sum of the properties of the components, but the summation of these properties as they mutually affect and modify each other."

It must therefore be recognized "that the problems of soil fertility are no longer problems merely of soil composition or merely of a supply of plant food. The great fundamental questions now are: What are the processes, physical, chemical, and biological, taking place continually in the soil? What are their magnitudes and what are the rates of change? How do they affect one another? What are the differences between individual soils that are the expression of the resultants of these interdependent processes?"

The difference between rye and wheat soils, A. STUTZER and W. HAUPT (*Fühling's Landw. Ztg.*, 64 (1915), No. 13-14, pp. 347-352).—In examinations of eight wheat soils and four rye soils no marked difference in chemical composition was observed, but mechanical analyses showed that the clay content and the content of fine particles in general were greater for the wheat than for the rye soils. These results are taken to indicate that, other conditions being approximately equal, mechanical analysis will probably in general serve as a basis for judgment as to whether a soil is better adapted to wheat or rye.

Studies of the influence of soil condition on the bacterial life and the transformation of matter in soils, H. R. CHRISTENSEN (*Centbl. Bakt. [etc.]*, 2, Abt., 43 (1915), No. 1-7, pp. 1-166, pls. 2, figs. 21; *Ber. Stat. Forsøgs Virks. Plantekult.*, 81 (1914), pp. 321-552, pls. 2, figs. 21; *abs. in Chem. Zentbl.*, 1915, I, No. 13, pp. 790, 791; *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 923, 924; *Zentbl. Agr. Chem.*, 44 (1915), No. 7, pp. 290-296).—A series of detailed investigations along lines similar to those previously noted (E. S. R., 13, p. 720), using Remy's method of cultures in inoculated solutions of mannite and a number of different soils for inoculation, are reported. The purpose was to study the relations between soil conditions and the activities of *Azotobacter*, the power of soils to ferment mannite and decompose peptone and cellulose, and the nitrifying power of soil.

It was found that the development of *Azotobacter* in mannite solution depended upon the presence of basic matter, either in the solution or in the soil used for inoculation. In no case was a growth of *Azotobacter* obtained with a base-free medium, but when the carbonates of calcium or magnesium were added a marked growth of *Azotobacter* was obtained in the solutions inoculated with raw cultures of *Azotobacter*. This is taken to indicate that the growth of *Azotobacter* in an inoculated lime-free mannite solution may indicate the presence of basic matter in the soil and that the method may serve to indicate the need of a soil for lime.

Experiments using mannite solutions with and without lime showed that the occurrence of *Azotobacter* is not so general as is commonly thought and that a sure indication of the basicity of a soil or of its need for lime can not be obtained by use of a lime-free mannite solution without inoculation with *Azotobacter*. It is concluded that the use of inoculated and uninoculated cultures will determine whether the absence of *Azotobacter* is due to the chemical or biological conditions of a soil, and that the occurrence and distribution of *Azotobacter* in soil are governed by its reaction and basicity. It is further concluded that *Azotobacter* practically never exist in acid soils and only seldom in neutral soils, and that the presence of basic lime and magnesia compounds is especially favorable for their growth.

Further experiments showed that a growth of *Azotobacter* on the addition of calcium sulphate to cultures of soils which had previously showed no

growth is an indication of the probable presence of alkaline carbonates in the soils. A marked development of *Azotobacter* in a mannite solution containing no phosphoric acid is taken to indicate that the soil used is probably not deficient in phosphoric acid.

It was found further that soils producing no fermentation of mannite in a lime-free mannite solution were very deficient in lime. This is taken to indicate that the degree of fermentation produced under such conditions serves as a measure of the amount of lime present in a form available to mannite-fermenting bacteria.

The addition of phosphoric acid to a peptone solution inoculated with decomposed peptone markedly aided the decomposition of the solution. The addition of carbon compounds did not accelerate decomposition, but humus and ferric phosphate did. Studies of the decomposition of peptone by soils, using inoculated and uninoculated cultures, showed that lowland moor peat soil possessed a much greater power for decomposing peptone than upland moor peat soil. The upland moor peat contained substances which inhibited peptone decomposition, but which were rendered inactive by adding calcium carbonate. Additions of calcium carbonate and phosphoric acid and of phosphoric acid alone to acid lowland moor peat favored peptone decomposition. Inoculation of the lowland moor peat cultures had no effect, but inoculation of the upland moor peat cultures markedly favored the decomposition of peptone.

In cultivated mineral soils peptone decomposition varied greatly. The phosphoric acid content of the soils especially influenced the degree of decomposition. All the soils tested appeared to contain sufficient humus for maximum peptone decomposition. With reference to the effect of inoculation of cultures with decomposed peptone the mineral soils were of two groups, namely, (1) those in which inoculation had little or no effect on peptone decomposition and which were in all cases basic, and (2) those in which inoculation markedly favored peptone decomposition and which were not basic. It is concluded that a soil of low peptone decomposing power forms an unfavorable medium for crop growth.

The decomposition of cellulose was usually found to be very small in humus soils. With upland and lowland moor soils practically the same differences were observed in cellulose decomposition as in peptone decomposition, except that the influence of chemical factors was more marked. Next to the content of basic lime and phosphoric acid, the availability of the organic nitrogen in peat was the factor controlling the decomposition of cellulose. In mineral soils it was found in all cases that the chemical condition of the soil mainly controlled cellulose decomposition, basic lime and phosphoric acid being the controlling factors.

In both humus and mineral soils nitrification was found to be governed mainly by their biological condition.

A list of references to literature bearing on the subject is appended.

On the presence of *Azotobacter* in Danish woods and on the value of *Azotobacter* cultures for the determination of the lime requirements in woodland, F. WEIS and C. H. BORNEBUSCH (*Forstl. Forsøgsv. Danmark*, 4 (1914), No. 4, pp. 319-337; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 4, pp. 546-548).—Experiments using Beijerinck's nutritive medium to determine the *Azotobacter* content of soils from 64 different localities in Danish forests are reported.

*Azotobacter* was found in only two of the soils, both of which showed marked alkalinity. In culture experiments in which the soil in question was substituted for calcium carbonate in Beijerinck's solution positive results were obtained in 32 out of 54 cases. "In several cases the dry leaves fallen to the

ground were examined for *Azotobacter*, but always with negative results. In the cases in which it was looked for in arable soils in the immediate vicinity of woods whose soil did not contain any species of *Azotobacter* its presence was easily demonstrated, but the species was always *A. chroococcum*."

The following general conclusions are drawn: "*Azotobacter* is only exceptionally present in Danish forest soils. In some localities in which the soil contains much calcium carbonate *A. beijerinckii* and *A. vitreum* are present. Consequently, for the supply of nitrogen to the forest soils of Denmark some other micro-organisms, probably lower fungi, must be of importance. . . . The culture of *Azotobacter* in Beijerinck's nutritive solution in which the lime is replaced by 5 gm. of the soil to be studied is a rapid and easy way of showing if a woodland to be regenerated requires lime or not since the calcium compounds that favor the development of *Azotobacter* in such cultures seem to be the same which facilitate the development of those organisms which lead to the production and conservation of a good mold and favor the development of forest trees, especially of beeches."

A report along similar lines by Christensen is noted above.

The nonsymbiotic nitrogen-fixing soil bacteria and their importance in natural economy, M. DÜGGELE (*Naturw. Wehnschr.*, 30 (1915), No. 42, pp. 657-664).—The author discusses the physiology and activity of the nonsymbiotic nitrogen-fixing soil bacteria, with special reference to their relation to soil fertility.

The fixation of potash by soil bacteria, S. KYROPOULOS (*Ztschr. Gärungsphysiol.*, 5 (1915), No. 3, pp. 161-166; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1396, 1397).—Studies of the potash-fixing powers of soil bacteria in soil and solution cultures, using cane sugar as the nutritive medium in soil and the Beijerinck nutritive solution, showed, with different potash additions, no analytical proof of the assimilation of any considerable amounts of potash by bacteria.

The antizymotic action of a harmful soil constituent: Salicylic aldehyde and mannite, J. J. SKINNER (*Plant World*, 18 (1915), No. 6, pp. 162-167).—Experiments with wheat in distilled water and in nutrient solution cultures to determine the influence on the crop growth of mannite alone and in combination with salicylic aldehyde are reported. Mannite was used alone in concentrations varying from 10 to 200 parts per million in distilled water, and in a concentration of 100 parts per million in nutrient solution. In the distilled water cultures "growth in some of the mannite concentrations was about equal to that in pure distilled water. Some of the cultures produced larger growth and others made less growth than in distilled water." It was further found that "the mannite in the nutrient solutions containing all three of the nutrient elements underwent decomposition, there was a formation of nitrites and ammonia, and consequently the decomposition caused poor plant growth. The solution in which there was no phosphate was not a good medium for the development of bacteria, consequently there was no decomposition of the mannite. Mannite as such does not seem to be harmful to wheat seedlings, and when decomposition does not take place the material would seem to be used by the plants and an increased growth results."

In further wheat-culture experiments in nutritive solution to which mannite was added in amounts of 100 parts per million and salicylic aldehyde in amounts of from 1 to 100 parts per million, it was found that "nitrites and ammonia formed in the duplicate mannite solutions and in those solutions which contained mannite together with 1, 5, and 10 parts per million of salicylic aldehyde. In the solutions which had no plants 25 parts per million and

more of salicylic aldehyde prevented any decomposition in the solution. In the solutions with plants it required as much as 50 parts per million of salicylic aldehyde in the mannite solutions to prevent decomposition. . . . In every case 25 to 50 parts per million of salicylic aldehyde in nutrient solution with mannite prevented any bacterial action."

Salicylic aldehyde was harmful to the growth of plants as well as to bacterial life.

**The importance of soil colloids for agriculture and forestry, P. ROHLAND** (*Forstlic. Centbl., n. ser., 37 (1915), Nos. 6, pp. 257-263; 10, pp. 455-460*).—An additional contribution to the subject is given, covering practically the same ground as previous articles (E. S. R., 34, p. 18).

**Colloidal clay, P. EHRENBURG and G. GIVEN** (*Kolloid Ztschr., 17 (1915), No. 2, pp. 33-37*).—After a brief review of the work of others bearing on the subject, experiments with a highly plastic clay are reported, the results are taken to indicate that the colloids of clay exhibit all the general characteristics of emulsoids.

**Moisture relations of some Texas soils, G. S. FRAPS** (*Texas Sta. Bul. 183 (1915), pp. 36, figs. 6*).—Two years' studies supplementing experiments previously noted (E. S. R., 33, p. 619) on the moisture content of clay, black clay, loam, sand, clay loam, and black clay loam soils under different conditions and fertility treatments are reported. Curves are given showing the moisture content of the soils at different periods and the relation of the moisture to the rainfall.

It was found that the average quantity of water in soils after continued rains was 58 per cent of the water capacity measured in the laboratory, and the maximum quantity was 69 per cent. "The soils retained when saturated to a depth of 14 in. enough water for from 12.6 to 19.1 bu. of corn, or from 150 to 234 lbs. of lint cotton. The crop draws upon a greater depth of soil for moisture, but there are also great losses due to evaporation."

Both cultivation and manuring increased the quantity of water held at the ends of the wet periods. The soils retained at the ends of the dry periods, on an average of the two years, 44 per cent of the water capacity measured in the laboratory. The lowest quantities reached in 1911 were from 33 to 46 per cent of the water capacity; in 1912, from 21 to 41 per cent. Cultivation and manuring increased the water content of the soils at the ends of the dry periods and decreased the loss by evaporation. There was a variation of about 50 per cent in the capacity of the various soils to hold water during wet periods and to retain water during dry periods.

**Absorptive power of soils of Mauritius, P. DE SORNAV** (*Dept. Agr. Mauritius, Sci. Ser., Bul. 1 (1915) [English Ed.], pp. 18; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1363, 1364*).—Two series of experiments with representative soils taken from different parts of the island of Mauritius are reported, the purpose of which was to determine their absorptive powers for ammonium sulphate, potassium nitrate, potassium sulphate, sodium nitrate, and calcium superphosphate. The first series consisted of percolation and the second of leaching experiments. Preliminary experiments showed that these soils when saturated contained an average of about 40 per cent of water, and that their average moisture content to a depth of 1 ft. was about 19 per cent.

The results of the main experiments led to the conclusion that the absorption of free or alkaline bases always takes place and that its intensity varies according to the nature of the soil. "In Mauritian soils this absorption of bases is particularly high when the conditions of experiments represent as nearly as

possible those of practice; and it may be said that the soil will give back, but with great difficulty and only after very heavy rainfalls, the ammonia and the potash retained. So long as rain falls slowly enough to prevent washing the soil will absorb high quantities of water which will be stored in the soil and subsoil, the latter remaining the reservoir of the cultivated soil. The soluble salts which are carried away will not be lost for plant growth. Surface tension and capillarity will bring them back to the surface. If rainfalls are heavy and compress the surface of the soil, washing will begin and a certain amount of cultivated soil will be carried away, together with the manure it contains."

**The adsorption of potassium by the soil,** A. G. McCALL, F. M. HILDEBRANDT, and E. S. JOHNSTON (*Jour. Phys. Chem.*, 20 (1916), No. 1, pp. 51-63, figs. 3).—A résumé of literature bearing on the subject is given, and experiments with a sandy loam soil in its natural state and with the same soil when ground for four days in a porcelain-lined ball mill are reported. The object was to determine the amount of potassium absorbed from percolating solutions of potassium chlorid containing 62 and 78 parts per million of potassium. The flow of the solutions during percolation was maintained at the rate of about 50 cc. in ten minutes.

With the natural soil and the weaker salt solution, it was found "that the first ten-minute contact of the solution with the soil reduced its concentration from 62 parts per million to 40 parts per million. At the end of the second ten-minute period the strength of the solution is further reduced to 36 parts per million, but from this point the concentration of the solution rises until the fifth and last fraction is reached, when the concentration is within three parts per million of the concentration of the original solution. The amount of potassium retained by the soil rises gradually to 233 parts per million of the dry soil when 250 cc. of solution have passed through."

With the finely pulverized soil and the stronger salt solution, it was found "that the amount of potassium in the solution has been increased instead of decreased by its contact with the soil." This is explained in part on the basis that the soil gave up some of its potassium to the percolating solution, and in part on the basis of selective adsorption "in which the solvent (water) is adsorbed more rapidly than the dissolved potassium salt, with the result that the percolate is more concentrated than the original solution."

**The absorption of the ultraviolet and infra-red rays by arable soil,** J. F. CRISTAN and G. MICHAUD (*Arch. Sci. Phys. et Nat. [Geneva]*, 4, ser., 39 (1915), No. 3, pp. 279-273, figs. 2; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 6, pp. 796, 797; *Rev. Sci. [Paris]*, 53 (1915), 1-11, No. 16, p. 376; *Sci. Abs., Sect. A-Phys.*, 18 (1915), No. 8, p. 401; *U. S. Mo. Weather Rev.*, 43 (1915), No. 10, pp. 510, 511; *Chem. Zentbl.*, 1915, I, No. 23, p. 1222).—Experiments on the absorbing power of calcareous, sandy, clayey, and humus soils, when dry and when damp, for the two invisible ends of the solar spectrum are reported, in which the photographic method was employed. The ultraviolet rays were isolated by filtering sunlight through a quartz lens covered with a very thin film of silver. A Wood filter was used for the separation of the infra-red rays.

It was found "that infra-red light is much less absorbed by damp soil of all four types than by dry and that the soils absorb these rays in the following ascending order: Calcareous, clayey, sandy, and humus. The ultraviolet light also is less absorbed by damp than by dry calcareous soil, but the difference is less for sandy soil and becomes imperceptible in the case of humus and clayey soils. The intensity of absorption is least in the case of calcareous soil, which

is followed by sandy soil, while it is greater for humus and clayey soils. The difference of behavior toward the rays of the two invisible ends of the spectrum is greatest in dry clayey soil. While this absorbs ultraviolet light very readily, it absorbs very little infra-red light."

**Soil temperatures, J. W. LEATHER** (*Mem. Dept. Agr. India, Chem. Ser., 4 (1915), No. 2, pp. 19-34, pls. 8, figs. 7*).—Two years' observations on the temperature of cropped and fallow alluvial soils at Puṣa containing a high proportion of calcium carbonate are reported. The temperatures were taken by means of self-registering thermometers placed horizontally in the undisturbed soil at depths of 1, 2, 3, 6, 9, 12, 18, and 24 in.

It was found that the temperature of the surface soil varied naturally with the hour of the day and with the season, the seasonal variations being minimum in January and maximum in May. In bare fallow soil "the diurnal change of temperature extends to between 12 and 24 in. from the surface on most days in the year. At 12 in. it amounts to about 1° C., but at 24 in. it is doubtful whether it ever exceeds 0.1° in Bihar and probably does not exceed 0.2° in any part of India.

"There is a fairly close correspondence between the temperature of bare fallow soil at 1 in. from the surface and that of the air in the shade. Approximately the soil minimum at this depth is about 2° higher than the air minimum, and the soil maximum is about 3° higher than the air maximum. There is also a similarly close relation between the diurnal change of temperature in the soil (bare fallow) at 1 in. from the surface and in the air (shade), the diurnal change being about 1.5° greater in the soil at this depth than in the air. This diurnal change is least during the monsoon and greatest during the dry season. At the former season (June to September) it is about 10° in the soil (bare fallow) at 1 in. deep, and during the latter (in March and April) it frequently approaches 20°.

"The temperature of the soil near the surface (down to 3 or 4 in.) is above the mean temperature for only about 8 hours daily, while it is below it for about 16 hours. The lag in temperature is about 2 hours at 3 in. deep and about 8 hours at 18 in. from the surface. A change in the specific heat of the soil, due to change of moisture content, does not seem to affect the maxima or minima; but rainfalls during the dry season, causing a considerable change in the amount of water evaporating, have a marked effect. . . .

"The effect of a covering crop on the soil temperature is very marked, for it both prevents the surface soil from rising to the temperature which fallow land assumes and also modifies the diurnal change. Thus while the temperature of exposed soil at 1 in. deep rises to about 3° above that of the air, that of cropped land is about 2° below it, and while the temperature of exposed soil at the surface rises to probably some 20° above that of the air, the corresponding figure for cropped land is only some 2 or 3° even in March, while in the rains it is actually lower than that of the air. Also in respect of diurnal change, at 1 in. deep, while exposed soil suffers a change of some 20° in March, that of cropped land is only about 13° at the same depth, and during the monsoon, while exposed soil suffers a diurnal change of some 10° at 1 in. deep, that of cropped land is only about 3 to 4°."

**Droughts, rainfall, and soil erosion** (*Union So. Africa Senate, 4. Sess., 1. Parliament, 1914, June 19, pp. XII+55+XXVIII, pls. 2*).—This is a report of an investigation by a committee of the senate of the Union of South Africa regarding the occurrence and variation of rainfall in South Africa, the causes and extent of soil erosion, and the drying up of certain areas in the Union, with suggestions of possible remedial measures.

Among the general conclusions reached from this investigation are that while the distribution of rainfall varies widely in different parts of the country from year to year and month to month and in proportion to the distance from the coast, the available evidence goes to show that there has been no definite diminution in the total rainfall of South Africa during historic times. There is, however, some evidence of cyclic or periodic variations. While denudation of the forested and grassed areas has not appreciably affected the total rainfall, it has been an important factor in increasing soil erosion. Other important factors are the making of roads, tracks, or paths, and the grazing of stock. It is stated that the combined effect of these various agencies "has been calamitous in the extreme."

The conditions which favor soil erosion have also been responsible for the drying up of the lands in certain parts of the country. Increased surface run-off has been accompanied by less penetration of moisture into the soil, and the formation of numerous gullies and drainage channels has resulted in the lowering of the underground water. The evidence appeared to be unanimous and conclusive "that many parts of the Union, in spite of the apparent constancy of the total amount of the rainfall, have been slowly but surely drying up, the rate of desiccation varying with the differences of locality, soil, and gradients; and that such parts must sooner or later become useless and uninhabitable if the process proceeds unchecked."

Among the remedial measures proposed are conservation of water by means of dams and irrigation works, encouragement of fencing, the increase of vegetation, control of veld burning, afforestation and reseeded to grass, and more attention to drainage in the construction of roads and railways.

The prevention and control of erosion in North Carolina, with special reference to terracing, F. R. BAKER (*North Carolina Sta. Bul. 236 (1916), pp. 27, figs. 25*).—This bulletin, prepared in cooperation with this Department, states that the area in which soil erosion is especially active in North Carolina is almost wholly within the Piedmont region, but that a considerable amount of the western Coastal Plain is subject to erosion, the whole area so affected covering over 10,000,000 acres. Methods discussed for the prevention of erosion are (1) proper cultivation, (2) tile drainage, (3) hillside ditches, and (4) terracing. The falling and level terraces are given the most attention.

"Of the two terraces the broad, level terrace is more ideal, but its use is limited to soils in good physical condition. The falling terrace can be more generally used and is probably best adapted to the conditions found generally in North Carolina. The fall of the terrace varies with the state of cultivation between 6 in. in 100 ft. and a dead level. The level terraces should be spaced three or four feet apart (vertical distance); and the falling terraces four or five feet apart (vertical distance). A broad mound should be maintained whether a level or falling terrace is used."

Useful accessories, including levels and terrace drags, are also described.

The increase of the ecological value of light soils by intermixing clay (Betonung), C. SCHNEIDER (*Fühlings Landw. Ztg., 64 (1915), No. 13-14, pp. 352-366*).—The author enumerates and discusses the factors influencing the ecological value of a soil, and, considering light sandy soils and heavy clay soils as representing practically the limits of soil texture, points out how a proper mixture of clay or clay soil with a light soil will indirectly increase the ecological value of the latter by favorably influencing the factors mentioned and resulting in a normal soil. A general classification of soils on the basis of their content of sand and clay is given, and the relations between the different classes and normal soils for different crops is discussed.

The use of dynamite in the improvement of heavy clay soils, L. E. CALL and R. I. THROCKMORTON (*Kansas Sta. Bul.* 209 (1915), pp. 34, figs. 8).—A series of experiments to determine the effect of dynamiting on the yield of different field crops, on the physical condition, moisture and bacterial content, and nitrifying powers of the soil, on the leaching of salts in alkali soil, and on the growth and vitality of fruit trees is reported. From one-half to one stick of dynamite was placed from 2½ to 3 ft. deep and from 15 to 20 ft. apart. While some benefits from dynamiting were observed in some cases, it was found that "in no instance was there improvement sufficient to pay the expense of dynamiting." The authors conclude that "heavy plastic clay soils will seldom, if ever, be found dry enough under field conditions in humid climates to be shattered or cracked by explosions of dynamite, and that the physical condition of such soils will usually be injured rather than benefited by dynamiting."

The box method of testing manurial requirements of soils, G. DE S. BAYLIS (*Jour. Agr. [New Zeal.]*, 11 (1915), No. 2, pp. 97-105, figs. 5).—A box culture method for testing the value of different fertilizer mixtures and for determining incidentally the factor or factors limiting the productiveness of a soil is described.

Liquid manure (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 16 (1915), No. 1, pp. 26-32, pl. 1, figs. 3).—Experiments on hay lands to determine the value of liquid manure applied at the rate of 16 tons per acre, as compared with barnyard manure applied at the same rate, and a complete artificial mixed fertilizer applied at the rate of 500 lbs. per acre, showed that the three manures produced very similar results, but on the average slightly in favor of the liquid manure. Methods of collection, storage, and distribution of liquid manure are briefly described.

The action of the nitrogen of sodium nitrate, ammonium sulphate, and lime nitrogen, S. HERKE (*Kisérlet Közlem.*, 18 (1915), No. 2, pp. 266-306).—Ten years' pot-culture experiments with barley, mustard, oats, and poppies on different soils to determine the relative values of sodium nitrate, ammonium sulphate, and lime nitrogen as sources of nitrogen are reported.

The kind of soil had a marked influence on the action of lime nitrogen. It had the most favorable action on loam soils rich in lime and humus, where it equaled ammonium sulphate in effectiveness. On sand soils rich in lime but poor in humus and on loam soils rich in humus but poor in lime, the lime nitrogen had a less favorable action than the other two fertilizers. Considering the effect of sodium nitrate as 100, in the first case the effect of ammonium sulphate was 92 and of lime nitrogen 62, and in the second case that of ammonium sulphate was 84 and of lime nitrogen 61. Lime nitrogen was in general favorable to the same plants as was ammonium sulphate, although its action was usually less marked. The final average results with all the crops and all the soil types showed that with sodium nitrate taken at 100, ammonium sulphate stood at 91 and lime nitrogen at 70.

The relative action of the nitrogen of lime nitrogen and of sodium nitrate, J. GYÁRFÁS (*Kisérlet. Közlem.*, 18 (1915), No. 2, pp. 307-325).—Three years' field experiments comparing the fertilizing action of sodium nitrate and lime nitrogen when used under winter rye, barley, and potatoes on meadow, and as a top-dressing for winter-seeded crops, showed that on the average, taking the effectiveness of sodium nitrate as 100, that of lime nitrogen was 66. No relation was observed between the kind of soil and the fertilizing action of lime nitrogen, except that on an excessively damp, acid meadow soil the lime nitrogen had little effect and in some cases was injurious.

Cause of the red coloration sometimes observed on decomposing Thomas slag with sulphuric acid, H. DITZ (*Jour. Prakt. Chem., n. ser.*, 91 (1915), No.

12, pp. 507-520; *abs. in Jour. Soc. Chem. Indus.*, 34 (1915), No. 18, p. 372).—Experiments are reported, the results of which are taken to indicate that the red coloration given by certain kinds of Thomas slag when decomposed with strong sulphuric acid is due to the presence of trivalent manganese, mainly in the form of a mangani-phosphoric acid compound. The color was also given by other kinds of basic slag to which potassium permanganate was added. By properly varying the conditions of temperature and oxidation it was possible to obtain, from the slag leaving the converter, a product giving a green-blue or red coloration with sulphuric acid. The oxidation of manganous oxid in slag, it is thought, can be promoted under certain conditions by the presence of free lime. It is considered probable that the proportion of ferrous oxid to manganese in the slag also has an influence on the formation of a compound giving a red coloration with sulphuric acid.

The pebble phosphates of Florida, E. H. SELLARDS (*Fla. Geol. Survey Ann. Rpt.*, 7 (1914), pp. 25-116, pl. 1, figs. 51).—This paper deals in detail with the origin, location, and conditions of deposition of the land and river pebble deposits of Florida.

Possible sources of potash in America, F. K. CAMERON (*Jour. Franklin Inst.*, 180 (1915), No. 6, pp. 641-651; *Amer. Fert.*, 44 (1916), No. 2, pp. 21-26; *Sci. Amer. Sup.*, 81 (1916), No. 2089, pp. 34, 35).—This is a discussion of desert basins, alunite, and kelp as possible sources of potash in America. It is concluded that "there are within the United States large stores of raw materials from which it is possible to obtain ample supplies of potash salts; that the technology of the subject is sufficiently developed to demonstrate the entire practicability of a supply from native sources, so far as physical factors are concerned."

Statistical potash fertilizer experiments in 1914, with special reference to top-dressings and meadow fertilization, M. HOFFMANN (*Mitt. Deut. Landw. Gesell.*, 30 (1915), No. 38, pp. 560-566).—A classified review of a number of experiments along this line is given.

The importance of fineness of subdivision to the utility of crushed limestone as a soil amendment, W. THOMAS and W. FREAR (*Jour. Indus. and Engin. Chem.*, 7 (1915), No. 12, pp. 1041, 1042).—The substance of this article has been noted from another source (*E. S. R.*, 34, p. 133).

The lime magnesia ratio in soil amendments, W. THOMAS and W. FREAR (*Jour. Indus. and Engin. Chem.*, 7 (1915), No. 12, pp. 1042-1044).—The substance of this article has been noted from another source (*E. S. R.*, 34, p. 133).

The effects of radio-active ores and residues on plant life, M. H. F. SUTTON (*Reading, Eng.: Sutton & Sons, 1914, Bul.* 6, pp. 15, figs. 4).—Box and laboratory experiments, described previously in a brief note by Bastin (*E. S. R.*, 33, p. 123), to determine the influence of two radio-active ores containing, respectively, 8 and 9 mg. of radium bromid per ton, of radium mine residue containing the equivalent of 1.8 mg. of radium bromid per ton, and of black oxid of uranium, on the growth of radishes, lettuce, peas, tall nasturtiums, and flowering annuals, and on the germination of red clover, smooth stalked meadow grass, and rape, are reported in detail. The radio-active ores were added to the vegetables at rates of from 1 part of ore to 12 parts of soil, to 1 part of ore to 48 parts of soil, and to tall nasturtiums at rates of from 1:14 to 1:2,240 parts of soil. The radium residue was added to nasturtiums at the same rates as the ore. Black oxid was added to the flowering annuals at the rate of 1 part to 2,000 parts of soil.

The results obtained "afford some evidence that radium emanations possess the property of developing and increasing growth. Many of the radish, lettuce,

and pea trials which were dressed with radio-active ore showed considerable superiority over those grown in plain soil, but the cost of the ore far outweighed the worth of the larger crop. . . .

"No material difference in results was apparent between the trials with ore incorporated with the soil and those with ore placed at the bottom of the boxes or pots. The quantity and degree of radio-active material to insure the best return can not be definitely stated, but it would appear that a light dressing is likely to give as good results as a larger amount. In the trials with rape seed, the influence of the radio-active material in accelerating germination was most consistent in all the tests, but it was evident that a very small quantity of low-grade residue proved as effective as a considerable amount of ore containing a much larger proportion of radium."

In the laboratory germination tests "there is no indication that better results are obtainable with ore possessing considerable radio-activity than with residue of low value, nor have these trials generally proved superior to the 'controls.'"

The influence of radio-active earth on plant growth and crop production, H. H. RUSBY (*Radium*, 4 (1915), Nos. 4, pp. 68-74, 5, pp. 94-104).—The substance of this article has been previously noted from another source (E. S. R., 33, p. 123).

Some chemical aspects of the peat problem, G. T. MORGAN (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 16 (1915), No. 1, pp. 39-45, pls. 4).—This article deals with the products of the peat industry, referring in particular to the production of ammonium sulphate and peat ash as fertilizers.

Commercial fertilizers, H. E. CURRIS and W. RODES (*Kentucky Sta. Bul.* 196 (1915), pp. 239-371).—This bulletin contains the results of analyses and estimated valuations of 734 samples of fertilizers and fertilizing materials offered for sale in Kentucky during 1915.

"The results of these analyses show that in most cases the samples analyzed have come fully up to the guaranty, or where there is a slight deficiency in one ingredient, it has been made up by an excess in one or both of the other ingredients. In a few instances, the deficiency in one ingredient, while fully made up by an excess of the other ingredients, is still too large to be considered acceptable."

### AGRICULTURAL BOTANY.

Experimental studies in the physiology of heredity, F. F. BLACKMAN ET AL. (*Abstr. in Rpt. Brit. Assoc. Adv. Sci.*, 84 (1914), pp. 245-247).—This is a report on work being conducted by Edith R. Saunders, R. P. Gregory, and Miss A. Gairdner.

In the study of half-hoariness in stocks and its relations to the glabrous and hoary forms a new half-hoary race has been obtained, which is being employed in a new series of experiments. Progress is reported in the further study of gametic coupling.

It has been found that the double-flowered plants, at least in some strains, make a more rapid and vigorous growth than the singles.

A beginning has been made in the work of obtaining a complete series of types of known factorial constitution for use in further study of the inter-relations between the factors determining hoariness and sap color.

Experiments investigating the cytology and genetics of certain giant races of *Primula sinensis* found to be in tetraploid condition have given results which are summarized in the statement that reduplication of the chromosomes is accompanied by a reduplication of the series of factors.

The investigations of Gregory on inheritance of green, variegated, and yellow leaves in *Primula* have been noted previously (E. S. R., 34, p. 226).

**Heredity and mutation as cell phenomena**, R. R. GATES (*Amer. Jour. Bot.*, 2 (1915), No. 10, pp. 519-528).—This is a discussion of several characters and their inheritance in certain *Oenotheras*, based upon the conceptions which the author favors of variation and inheritance, namely, the process by which new differences arise and the process by which they are perpetuated.

Not only do parallel mutations occur independently in species widely apart, but wide differences are found in the types of change which give rise to them. Emphasis is laid on the statement that each mutation is the result of a cell change which is repeated in every part of the organism, having originated in the fertilized egg. A mutant is such because not only germ cells but somatic cells contain a certain peculiarity. It is thought that a female animal, like a mutant, is somatically distinguished by a different chromosome content in all its tissues and that many important implications lie in this fact.

The *O. rubriculata* character is considered an example of a mutation fundamentally chemical, though the precise nature of the change by which it is produced is as yet unknown. It is thought probable that *O. rubriculata* is also a cell mutation, the nuclei in all parts containing a descendant of the original changed chromosome. Parallels to this mutation are found in such plants as the copper beech and the red sunflower, which belong to widely separated groups.

**Genetical studies on *Oxalis***, S. NOHARA (*Jour. Col. Agr. Imp. Univ. Tokyo*, 6 (1915), No. 2, pp. 165-182, pl. 1).—The results are given of a study of several forms of *Oxalis* growing in Tokyo and its vicinity. A number of these forms, which are characterized by differences in flower and leaf color, were grown as pedigree plants and used in crossing experiments.

As a result of the culture work some of these forms were found to be distinct biotypes. In the materials employed the presence or absence of purple in the corolla and leaves was used as a distinctive character. This color is said to be due to the presence of a purple cell sap. Four of the five pedigree cultures were found to be pure types, while one split into forms of the pure types upon self-fertilization. In the hybrids the presence of a factor or factors of purple color was found dominant over the absence of the same. An  $F_1$  generation was found intermediate in color intensity between its parents. The two reciprocals of any of the hybrids were found to be of exactly the same nature so far as the author's investigations are given.

**Self-pollination and the possibility of artificial cross-pollination in rice**, R. FARNETI (*Atti Ist. Bot. R. Univ. Pavia*, 2. ser., 12 (1915), pp. 351-362, pl. 1).—The author has studied the possibility of accomplishing artificial fertilization in rice. It was found that with sufficient skill and patience this could be brought about at the proper stage by introducing a fine instrument through the minute opening at the points of the glumes. It was, however, difficult to avoid causing self-fertilization or injury resulting in sterility.

**The nature of peloria in flowers**, M. J. SIRKS (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 14 (1915), No. 2, pp. 71-79).—The author, giving results of his own studies, holds with Vöchting (E. S. L., 9, p. 1027) that peloria is due, not to external conditions primarily, but to the operation of causes which are interior to the plant itself and bound up with the constitution of the species. In the cases studied, peloria and fasciation appear to be the results of independent processes. A bibliography is given.

**The nature of peloria**, M. J. SIRKS (*Arch. Néerland. Sci. Exact. et Nat.*, Ser. 3 B, 2 (1915), No. 2, pp. 239-283, figs. 3).—This is a more extended presentation of the material above reported, with a discussion of heredity and of external influences as related to peloria.

Recent studies on the formation of flower coloring materials, ELISABETH SCHIEMANN (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 14 (1915), No. 2, pp. 80-96).—This is a brief discussion of the results of studies reported during 1902 to 1914 by a number of authors listed with their contributions. The material, which is regarded from the standpoint of Mendelian splitting, is discussed under the main heads of the glucosid-splitting enzym, the oxidases, the limiting factor, and the chromogens.

The relation between vegetative vigor and reproduction in some Saprolegniaceae, A. J. PIETERS (*Amer. Jour. Bot.*, 2 (1915), No. 10, pp. 529-576, figs. 2).—The author, reporting a study of *S. ferox*, *S. monoica*, *Achlya racemosa*, and *A. prolifera*, states that there is no constant relation between vegetative growth and sexual reproduction when the concentration of the food supply exceeds the minimum requirement of the species therefor. This is not far from 0.1 per cent of peptone for the production of both sporangia and oögonia.

Tendencies developed by a mycelium while growing vegetatively may affect the number and character of the reproductive organs produced later under different conditions. Maltose and levulose are especially favorable among the carbohydrates used as regards vegetative growth, and the latter has an especial value for the production of oögonia. Sucrose is probably not used by species of Saprolegnia or of Achlya unless it is first inverted by some other agency. Phosphates tend to increase the reproductive capacity of the fungus.

The achievement of comparable results requires the use of a medium of definite and known composition.

A bibliography is given.

On the influence of nutrition upon the development of sexual organs in the fern prothallia, I. NAGAI (*Jour. Col. Agr. Imp. Univ. Tokyo*, 6 (1915), No. 2, pp. 121-164, pl. 1, figs. 7).—On account of recent investigations showing the effect of nutrition on the development of sex in plants, the author made a study of the influence of nutrition on the development of sexual organs in the gametophytes of *Osmunda regalis japonica* and *Asplenium nidus*.

The prothallia were grown from spores in Knop's solution, and it was found that the development of antheridia and archegonia was dependent upon the concentration of the solution in which they were grown. The prothallia of *O. regalis japonica* grown in solutions which lacked calcium and magnesium salts were almost completely sterile. Starch was found to accumulate abnormally in the chlorophyll bodies of prothallia of *Osmunda* which were grown under a nitrogen-hungry condition, but a normal condition was soon restored if weak solutions of ammonium salts and nitrates were supplied.

Relation of moisture to seed production in alfalfa, J. N. MARTIN (*Iowa Sta. Research Bul.* 23 (1915), pp. 302-324, figs. 2).—A report is given of investigations conducted to determine the cause of the frequent failure of alfalfa to produce seed in Iowa.

As a result of laboratory and other experiments, it was determined that the proper functioning of alfalfa pollen is the limiting factor in seed production. For the germination of the pollen, a proper supply of water is required, and a certain ratio between the moisture delivered by the stigma and the moisture of the air was found necessary. When the optimum supply of soil and atmospheric moisture is present, an increase in soil moisture resulting in an increased moisture delivery of the stigma, or a change in the atmospheric moisture disturbs the supply for pollen germination and prevents fertilization. The blasting of seed is said to be commonly due to arrested development, and this may be brought about by inability on the part of the plant to furnish the proper water and food supply, or it may be due to pathological conditions to which the seed is susceptible under drought conditions.

**The presence and physiological significance of tannin in plants.** C. VAN WISSELINGH (*Bot. Centbl., Beihefte*, 32 (1915), 1. Abt., No. 2, pp. 155-217, pls. 2).—The author describes researches carried on by himself with *Spirogyra maxima* as regards tannin. It is claimed that this plant contains a substance closely allied to gallotannin in the cell sap, and that the precipitate obtained by the use of certain bases is a tannin and not a nitrogen product. Antipyrin and caffeine have proved to be well adapted to the demonstration of tannin in living cells without injury thereto.

It is thought that in case of *S. maxima* the tannin present in the cell sap is not an excretion product or a reserve material, but a solute in process of utilization by the plant along with other dissolved substances.

Correlations appear to exist between tannin and other bodies, as chromatophores and starches.

**Elaioplasts in monocotyledons and dicotyledons.** I. POLITIS (*Atti Ist. Bot. R. Univ. Pavia*, 2. ser., 12 (1915), pp. 345-350).—The author claims to have found elaioplasts in 27 species representing 19 genera of monocotyledons, and in the Malvaceæ among the dicotyledons. They are to be regarded as the specific organs of the cell which are concerned with the elaboration of oily material. Elaioplasts are regarded as fundamentally similar in substance to the nucleoli. In bulbs, it is stated, new elaioplasts are formed with each resumption of vegetative activity.

**The electrical conductivity of sap in vegetable tissues.** EVA MAMELI (*Atti Ist. Bot. R. Univ. Pavia*, 2. ser., 12 (1915), pp. 285-297).—The author shows that successive degrees of torsion or pressure to which the tissues of *Opuntia ficus indica* and of *Agave americana* were subjected gave corresponding increases in the conductivity of the expressed sap.

In case of *Dioscorea hookeri*, *Aloe grandidentata*, and *A. africana*, permitted to dry slowly at from 16 to 20° C., the specific conductivity diminished at first, but later increased. In case of the last two of these and of *A. striata*, it appears that the specific conductivity decreases with the age of the organs.

In *O. ficus indica* and *Agave* sp., the specific conductivity of leaf tissue from the basal region exceeded that from the apical portions.

**Studies on wilting, drying, and returgescence of plants.** H. HOLLE (*Flora [Jena]*, n. ser., 8 (1915), No. 1-3, pp. 73-126, figs. 6).—The author has studied various plants as to the conditions in the vascular elements in wilting or drying shoots, the changes in living parenchyma cells while drying out, the relations of air to drying cells, and the restoration of turgor, including the influence of temperature in this connection. He has also considered some implications of water movement theories.

It is stated that in the neighborhood of wounds the concentrating cell sap withdraws water from the uninjured cells. The cell membranes shrink with the diminution of the cell contents. The shrinking of the cell wall is noted in dead as well as in live cells. Small, gas-filled spaces may appear in the parenchyma cells as they dry, but they do not restore the form of the crinkled cell membrane. Thin walled parenchyma cells show no such bubbles, being pressed together in a compact mass. While dead cells are losing their water, cohesion tensions are set up of various degrees of intensity before the gas bubbles appear. Penetration of membranes by air in case of pressures of one atmosphere or less does not occur so long as the cell is filled with water. Restoration of turgor in detached shoots occurs in warm water somewhat more quickly than in cold, within certain limits of resistance of the cut surface.

A bibliography is appended.

**Some relations of plants to distilled water and certain dilute toxic solutions.** M. C. MERRILL (*Ann. Missouri Bot. Gard.*, 2 (1915), No. 3, pp. 459-506,

pls. 4, figs. 4; *Amer. Jour. Pharm.*, 87 (1915), No. 12, pp. 549-555; 88 (1916), Nos. 1, pp. 12-22; 2, pp. 71-82, figs. 3; 4, pp. 156-164, fig. 1).—Briefly reviewing related contributions, the author outlines his own work with *Pisum sativum* and *Vicia faba*.

Renewing the distilled water every four days increased the growth of the top and roots, lengthened the life of the plants, and continued growth longer after they were placed in a full nutrient solution. The period between 5 and 10 days in distilled water appears to be a critical one for these plants as regards complete recovery in a full nutrient solution. Sterilizing the distilled water every four days by boiling for  $\frac{1}{2}$  hour favored continued growth. Greater total exosmosis was obtained in the renewed than in the unrenewed distilled water.

Normal plants grown for some time in a full nutrient medium and then transferred to distilled water exhibited at first greater excretion than absorption of electrolytes, but after a day or two absorption was in excess and conductivity declined, sometimes for a considerable period of time. The conductivity curve of the full nutrient solution fell for about the first 15 days of growth therein to a horizontal which was maintained for about 50 days. The growth curve was in general opposite to that of conductivity. Exceptional features are also noted. Greater deterioration of the roots in distilled water occurred if the plants had not previously been grown in full nutrient solution.

The conclusion is thought to be justified that pure distilled water is not of itself toxic or injurious to plants, and that various other factors must aid in causing the deterioration observed in this connection. The author inclines to the view that, while exosmosis of food materials or nutrient salts is not responsible for the injury observed, the question of food relations does play an important part in the incipency of the trouble, this being quickly followed by factors initiated as a result of the inimical food or nutrient relation. It is thought possible that in the absence of available food the tissues of the plant begin to disorganize and thus fall a ready prey to fungus and bacterial action, which continues and extends the injurious effects.

A bibliography is given.

Electrolytic determination of exosmosis from the roots of plants subjected to the action of various agents, M. C. MERRILL (*Ann. Missouri Bot. Gard.*, 2 (1915), No. 3, pp. 507-572, figs. 18).—In this paper are given the results of studies on the effects of agencies which are considered as actively injurious, as distinguished from the operation of the agencies considered in the paper above noted. An attempt was also made to determine the approximate boundary between normal and abnormal exosmosis.

It was found that pea seedlings grew better in distilled water in which exosmosis from previously treated plants of the first crop had occurred than in fresh distilled water or in that in which untreated plants had been grown. Peas or horse beans grew better in fresh distilled water than in distilled water in which seedlings had already grown for 21 days.

Abundant exosmosis may occur from treated plants, the roots remaining normal in appearance. Anesthetic vapors cause marked exosmosis after long exposure, the order of greatest effectiveness being chloroform, illuminating gas, and ether. The time limits for the exposure to extremes of temperature in relation to exosmosis were determined, and comparison was made between the effect of dry and that of moist heat. The exosmosis curves were found for various organic compounds, which, at the concentrations used, produced marked excretion, and the effects of salts, singly and in pairs and with anesthetics in solution, were ascertained. Antagonistic relations were not discovered in the course of this work.

The effects of heat and cold are considered as resulting in a complete or incomplete disorganization of the cell, depending upon the duration of exposure and a consequent escape of some of the contents. The observations here recorded are not considered to substantiate the view that anesthesia is a reversible process, the excretion process induced by an anesthetic conforming in every way to an irreversible chemical reaction. It is further believed that the results obtained by antagonistic pairs of salts and by single salts are also to be explained, as far as resulting exosmosis is concerned, in the specificity of the action of each.

A bibliography is appended.

**The question of the toxicity of distilled water,** R. P. HIBBARD (*Amer. Jour. Bot.*, 2 (1915), No. 8, pp. 389-401).—The author refers to articles by Livingston, Hoyt, and True, respectively (*E. S. R.*, 19, p. 13; 31, pp. 32, 730) as affording a complete summary of the work done in the past on the toxic effects of distilled water. This is said to have been about equally divided between animal and plant physiologists. He then details his own investigations, employing as indicators the roots of *Lupinus albus* and relating first to the problem of adjustment and second to that of toxic root excretions.

It is held that by some process of acclimatization or adjustment, lupine seedlings give better growth in distilled water if change to that medium from tap water is made gradually rather than suddenly, and that this fact should never be neglected in cultural work. It appears also that roots of lupine seedlings excrete a substance that inhibits growth therein and produces also abnormalities of development as regards form and direction. It is thought that the harmfulness of distilled water may be considered as due, not to any one predominant factor, but to a resultant of many, consisting of a disturbance of the normal equilibrium of the various chemical and physical interactions within the organism and between it and its environment.

**Plant records of an expedition to Lower California,** E. A. GOLDMAN (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 16 (1916), pt. 14, pp. 309-371+XIII, pls. 31).—A list is given of plants collected in Lower California in 1905 and 1906, along with notes on distribution and descriptive, ecological, and economic data. The work includes descriptions of three new species of oak, *Quercus brandegei*, *Q. idonea*, and *Q. devia*.

**New or noteworthy plants from Colombia and Central America,** V. H. PITTLER (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 18 (1916), pt. 4, pp. 143-171+IX, pls. 24, figs. 10).—The author describes a number of trees and shrubs of Central America and northern South America which were hitherto imperfectly known or not described.

### FIELD CROPS.

**Moisture content and shrinkage of forage and the relation of these factors to the accuracy of experimental data,** H. N. VINALL and R. MCKEE (*U. S. Dept. Agr. Bul.* 353 (1916), pp. 37).—This bulletin is a report on a series of experiments made during 1914 to secure data on which to base a sampling system giving greater accuracy to field tests in forage experiments. The plan consists essentially in taking small samples at the time of weighing field-cured or green material for use in determining the moisture content of the material and applying the data in reducing the yield either to an air-dry or to a dry-matter basis.

In the experiments described the efficiency of correcting ordinary green and field-cured forage weights with 2, 4, 6, 8, 12, or 16 lb. samples was determined with a number of crops at different points. Of ordinary field-cured forage 100 lbs. was taken from the shock or windrow and 500 lbs. of green forage was

taken immediately after cutting and placed on a canvas to prevent loss of weight other than moisture. When this forage had become sufficiently dry the lots were placed in burlap bags and kept in an open shelter until they ceased to lose weight. Composite samples of 2, 4, 6, and 8 lbs. of field-cured forage, part from the outside and part from the inside of shocks, were secured at the same time and from the same material as the 100-lb. lots before mentioned and allowed to become perfectly air-dry. Samples 4, 8, 12, and 16 lbs. in size of green forage were taken immediately after cutting and were treated similarly. Samples were replicated five or six times to check the variation due to sampling. All samples were taken at the stage of maturity generally recognized as the proper cutting time for each crop. The data secured are arranged in tables and discussed.

The study of the use of samples in correcting forage yields indicated that air-dried samples, while a little less accurate than oven-dried samples, can be relied upon for all practical purposes in correcting forage yields. Much greater extremes were found in the samples of field-cured material than in the samples of green material. It is believed that with the proper care in sampling correction by means of samples can be accurately made from either green or field-cured material. The percentage of moisture in different crops when these are ordinarily harvested for forage was as follows: Alfalfa at Chico, Cal., 75 to 78 per cent, average 76.9 per cent; alfalfa at Arlington Farm, Va., 74 to 76.5 per cent, average 75.2 per cent; tall oat-grass and orchard-grass mixture at Arlington Farm, Va., 71 to 73 per cent, average 72 per cent; timothy at New London, Ohio, when in full bloom, average 67.2 per cent; sorghum at Amarillo, Tex., 70 to 73 per cent, average 71.2 per cent. The average amount of moisture found in field-cured material was as follows: Alfalfa, 22.3 per cent; timothy, 20.3 per cent; tall oat-grass and orchard-grass mixture, 29 per cent; sorghum, 43.2 per cent. It is stated that the moisture content of field-cured material varies so widely that it can not be foretold with accuracy.

The following results were secured in the study of the relation of the moisture content to the stage of development: Alfalfa at Chico, Cal., very young (12 in. high), 78.9 per cent; one-tenth in bloom, 77.1 per cent; full bloom, 74.6 per cent; past full bloom, 73.4 per cent. Sorghum at Amarillo, Tex., very young, 90.6 per cent; shooting for heads, 87.1 per cent; beginning to head, 84.8 per cent; full bloom, 80.4 per cent; seed ripe, 75.3 per cent. The results with sorghum at Hays, Kans., showed practically the same gradations as at Amarillo, Tex. Timothy at New London, Ohio: Very young (10 to 12 in. high), 77.5 per cent; just heading, 76.6 per cent; early bloom, 71.4 per cent; full bloom, 67.2 per cent; leaves drying, 58.6 per cent; seed mature, 51.2 per cent.

The results of a study of the rate of loss of moisture in forage during the early stages of curing are shown in the following table:

*Approximate moisture losses in different crops during the first four hours of curing.*

Crop and location.	Moisture loss.				
	½ hour.	1 hour.	2 hours.	3 hours.	4 hours.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Alfalfa at Chico, Cal. ....	.....	17	35	.....	60
Alfalfa at Arlington Farm, Va. ....	6	14	23	28	32
Tall oat-grass and orchard grass at Arlington, Va. ....	5	12	24	30	34
Timothy at New London, Ohio. ....	6	10	18	25	29
Sorghum at Hays, Kans. ....	2	5	9	12	13

It was observed that the rate of loss of moisture after cutting differed in different varieties of the same crop as well as in different crops. Arabian alfalfa lost moisture faster than Peruvian or ordinary alfalfa in the first one or two hours after cutting, but the total percentage of moisture was about the same in the three varieties. A high percentage of leaf surface in alfalfa was correlated with a rapid loss of moisture immediately after cutting, but it did not indicate a high moisture content.

Studies of the shrinkage in hay after storing and variation of moisture content due to changes in atmospheric humidity showed that at Chico, Cal., baled oat hay in 1914 lost 8.1 per cent in weight between June 1 and August 31, and gained 5.9 per cent of the original weight from August 31, 1914, to February 25, 1915. The results at this point indicated that even baled hay responds noticeably to changes in atmospheric humidity. Results secured at New London, Ohio, with loose timothy indicate a shrinkage of 8.6 per cent in one lot and 15.6 per cent in another lot when the hay was stored in a barn for about three months. The effect of a week of rainy weather was indicated by an increase of weight in the loose hay.

**A method of correcting for soil heterogeneity in variety tests,** F. M. SURFACE and R. PEARL (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 22, pp. 1039-1049, figs. 4).—This article, from the Maine Experiment Station, proposes a method for use in correcting for differences in the soil of different plats, when the plats are arranged in a certain definite way.

The method involves in the first place the determination of the probable yield by the contingency method. This calculated yield is taken as representing the most probable yield of each plat on the supposition that they have all been planted with a hypothetical variety whose mean yield is the same as the observed means of the field. This calculated yield is used as a basis for determining a correction factor. If the calculated yield of a given plat above the mean of the field, it is regarded that the soil of this plat is better than the average of the field and a corresponding amount is deducted from the observed yield. If the calculated yield is below the average, a proportional amount is added to the observed yield in order to make the plats comparable. The results are considered still more comparable if the correction factors are based upon the percentage of the mean rather than upon the absolute figures. An application of the method upon experimental plats led to results which are believed to represent the truth more nearly than do uncorrected yields.

**Colonial plants.—Textile plants,** H. JUMELLE (*Les Cultures Coloniales. Plantes Textiles*, Paris: J. B. Baillière & Son, 1915, vol. 6, 2. ed., ent., pp. 118, fig. 33).—This is part 6 of the second revised edition of the author's work (*E. S. R.*, 33, p. 437), treating of kapok, cotton, coconut fiber, New Zealand hemp, Sansevieria, abacá, sisal hemp, agave, ramie, jute, hibiscus, and sann.

**The curing of blue-grass seeds as affecting their viability,** H. GARMAN and E. C. VAUGHN (*Kentucky Sta. Bul.* 198 (1916), pp. 27-39, pls. 5).—Germination tests of blue-grass seeds subjected to different temperatures in the process of curing showed that seeds allowed to heat to 140° F. even for a short time are worthless, and that the seeds should never be permitted to heat above 122° F., as prolonged heating even at this temperature reduces the percentage of germination.

To show the influence of handling on the quality of the seeds, the following averages are given of germination percentages taken from records made in 1915; 12 tests of samples taken from bags at warehouses averaged 33.25 per cent; 18 samples from ricks at warehouses averaged 57.44 per cent; 12 samples from ricks in barns averaged 56.2 per cent; 10 samples from ricks out-of-doors

averaged 69.3 per cent; and 8 tests of hand-stripped samples averaged 73.62 per cent.

Observations by the authors led to the conclusion that the seeds are best when harvested in that locality from about June 15 to 20. Methods of harvesting and curing are described with a view to getting cleaner seed and higher viability.

**Testing seed corn.** C. G. WILLIAMS (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, p. 96*).—The yields of corn for the years 1911–1915, inclusive, in an experiment at the Ohio Station averaged 54.49 bu. per acre from untested seed and 58.60 bu. from tested seed. It is pointed out that this increase of 4.11 bu. per acre at 50 cts. per bu. represents a return of \$6.85 an hour for the time spent in testing.

The moisture content of 5 varieties of corn was determined early in November in 1908; 1914, and 1915, the average being 19, 26.6, and 33.5 per cent, respectively. Attention is called to the high moisture content of the 1915 crop and its relation to the percentage of germination.

**Cotton experiments, 1915.** H. B. BROWN (*Mississippi Sta. Bul. 173 (1916), pp. 1–27, 29, figs. 3*).—This bulletin reports in part the results of cotton experiments conducted in 1915 at the Mississippi Station and the Holly Springs and Delta substations. Results of similar experiments have been previously reported (*E. S. R., 32, p. 734*). Temperature and rainfall records presented are regarded as showing practically no relation between cotton yields and rainfall and temperature fluctuations during the growing season.

A test of 21 varieties or strains at the station indicated the general superiority of Wanamaker-Cleveland, Cleveland Big Boll, and Miller among the big boll varieties, although on rich bottom lands under boll-weevil conditions the smaller early-maturing varieties such as Trice and Dodds Prolific will possibly be more satisfactory. Express is regarded as ranking as a long-staple cotton for boll-weevil conditions and Unknown as comparing very favorably with Express.

Several varieties grown on silty loam land infested with cotton wilt were tested as to their resistance to the disease. Simpkins and Trice, known to be susceptible, were badly attacked while Dixie and Covington-Toole, resistant varieties, had practically no plants that showed external symptoms of the disease, and although a number of the plants were infected, their yield was not affected materially. Wanamaker-Cleveland, a variety of medium resistance which led in production per plant, is considered as possibly the best cotton obtainable when the crop must be grown under the conditions of the experiment.

Plats sprayed with a proprietary preparation to combat the boll weevil showed a total yield of seed cotton of 1,164 lbs. per acre for April plantings and 264 lbs. for June plantings, as compared with 1,176 and 256 lbs., respectively, for unsprayed plats.

The 6-year average yield of seed cotton per acre in a test of growing plants 1, 2, or 3 ft. apart in the drill was in favor of the 1-ft. distance with a yield of 1,643.5 lbs. The 5-year average yield of seed cotton per acre in a test of different distances between the rows was in favor of 3 ft., the smallest distance, with a yield of 1,446 lbs.

The results of the variety tests at Holly Springs, which are given in a table, indicated that Wanamaker-Cleveland, Cleveland Big Boll, Miller, and Triumph are among the leading varieties for the hill section of the State. Results of a variety test at Delta branch station are tabulated but no conclusions with reference to individual varieties are drawn. The variety averages for the three stations and the rank of varieties grown the last five years on the basis of money value per acre are also presented in tables.

**Report on variety tests of cotton for 1915, R. Y. WINTERS and V. R. HERMAN** (*Bul. N. C. Dept. Agr.*, 37 (1916), No. 2, pp. 3-15).—On the station farm near Raleigh 37 short-staple varieties ranged in yield from 926 to 1,417 lbs. of seed cotton per acre, and 7 long-staple varieties from 976 to 1,297 lbs. of seed cotton per acre. In this test the highest yielding strains produced a shorter fiber. A comparison of five strains of Cleveland Big Boll and six strains of King showed that strains of the same variety may differ in character of plant, size of boll, shape of leaf, and yield.

In a test at Iredell farm of 21 short-staple varieties of cotton including the earliest medium boll and the small-boll varieties, the yields ranged from 370 to 1,261 lbs. of seed cotton per acre. The yields of the different varieties and strains are given in tables.

**Japanese cane, J. M. SCOTT** (*Florida Sta. Bul.* 129 (1916), pp. 21-44, figs. 4).—The culture and uses of Japanese cane are discussed, and the results of culture and fertilizer tests, together with analyses and other data as to the chemical composition of the crop with reference to its feeding and fertilizer value, are reported.

In the fertilizer experiments, conducted on 8 plats from 1909 to 1914, inclusive, 112 lbs. of dried blood, 72 lbs. of sulphate of ammonia, 84 lbs. of muriate of sulphate of potash, and 224 lbs. of acid phosphate per acre were used in different combinations. One plat received in addition in 1909, 1911, and 1913 an application of 2,000 lbs. per acre of ground limestone. The yields in tons of green material per acre in 1909 ranged from 16.10 on the plat receiving dried blood and acid phosphate to 27.03 on the plat receiving dried blood, sulphate of potash, acid phosphate, and ground limestone. The yields decreased greatly from the first to the sixth year and the averages ranged from 7.55 to 13.7 tons of green material per acre on the different plats. The results showed in general that on the soil on which the cane was grown potash was most beneficial, and nitrogen appeared to be next in importance. Ground limestone acted as a temporary stimulant and no results were apparent except from the first application. The method of fertilizing the soil had no effect on the percentage of sucrose in the juice.

A test of replanting cane on each of the 8 plats in 1915 gave yields of green material per acre ranging from 18 to 81.9 tons. It is believed that better yields of Japanese cane will be obtained by replanting every third or fourth year.

**Sudan grass, C. G. WILLIAMS** (*Mo. Bul. Ohio Sta.*, 1 (1916), No. 3, pp. 67-70, fig. 1).—Notes are given on the seeding, harvesting, and feeding value of Sudan grass. The average yield of Sudan grass at the station for the years 1912-1914, inclusive, was 4.3 tons of dry hay per acre as compared with 3.9 tons of German millet.

**Manurial experiments on sugar cane, 1912-1914, J. DE VERTEUIL** (*Bul. Dept. Agr. Trinidad and Tobago*, 13 (1914), No. 82, pp. 227-234, pl. 1, fig. 1).—These experiments were conducted under the control of the Board of Agriculture on the Brechin Castle, Esperanza, and Malgretoute estates. On each estate, of the eight plats devoted to the work, the first four, constituting a nitrogen series, received a complete application, the fifth plat nitrogen and phosphates, the sixth nitrogen and potash, the seventh nitrogen alone, and the eighth was a control. Nitrogen was applied in all cases at the rate of 45 lbs. per acre, phosphates in the form of dissolved bone at the rate of 40 lbs., and potash in the form of the sulphate at the rate of 28 lbs. with the exception of plat 6 which received 40 lbs. In the nitrogen series, plat 1 received calcium nitrate, plat 2 sodium nitrate, plat 3 calcium cyanamid, and plat 4 sulphate of ammonia.

On the Brechin Castle estate plat 1, receiving the calcium nitrate, gave the largest profit, \$3.11 per acre, but in no case was the increase resulting from fertilizer treatment sufficient to pay for the cost of the fertilizers. On the Esperanza estate the calcium nitrate plat was also the best, showing an increase of \$8.30 in the value of the crop produced as compared with the control plat. All plats treated with sulphate of ammonia showed a loss. On the Malgretoute estate the results in no case showed an increase sufficient to pay for the cost of applying the fertilizers. At this place an additional plat which received an application of Peruvian guano at the rate of 3 cwt. per acre gave a profit of \$11.04 per acre.

**Manurial experiments on sugar cane, 1912-1915, J. DE VERTEUIL** (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 5, pp. 145-155, pls. 3*).—This gives the results of an experiment to determine the value of different forms of nitrogen used on plant and first ratoon canes and continues the work noted above.

The greatest profit from first ratoons at the Brechin Castle estate was obtained from the plat receiving sulphate of ammonia and sulphate of potash, and the lowest return from the plat receiving nitrogen only in the form of sulphate of ammonia. The plat yielding the largest profit from the Esperanza estate was the one receiving sodium nitrate in connection with phosphoric acid and potash, while the least return was obtained from the plat receiving sulphate of ammonia and potash and that receiving sulphate of ammonia alone. The largest return from the Malgretoute estate was obtained by the use of calcium cyanamid with phosphoric acid and potash, and the smallest return from the plat receiving calcium nitrate with phosphoric acid and potash.

**Proceedings of the Association of Official Seed Analysts of North America, 1914** (*Proc. Assoc. Off. Seed Anal. of No. Amer., 1914, pp. 32*).—A brief résumé of the development and activities of the association is given, together with the following papers presented at the seventh annual meeting (E. S. R., 32, p. 200): The Necessity for Standardization of Methods, by E. Brown; Uniform Methods of Sampling Seed, by E. D. Eddy; Apparatus and Methods Employed in Making Purity Tests of Seeds, by F. H. Hillman; The Enforcement of the New Jersey Seed Law, by J. P. Helyar; The Weed Content of Seeds, by A. L. Stone, which includes a table giving the number of seeds borne by 29 annual, 17 perennial, and 8 biennial weeds; and The Weed Content in Some Commercial Seeds, by L. H. Pammel and Charlotte M. King.

A paper on The Germination of Seeds Buried Ten Years, by W. L. Goss, points out that of 112 varieties 21, including only 4 weeds, never produced any sprouts after being buried; 69 produced sprouts after 10 years' burial; and the remainder perished during the interval. Of the 69 living at the end of 10 years 26 germinated 51 per cent or better, 13 between 25 and 50 per cent, 13 between 10 and 24 per cent, and 17 below 10 per cent. Attention is further called to the fact that green foxtail germinated 79 per cent at the end of 10 years. Broad leaved or bitter dock germinated 89 per cent in 10 years, black nightshade 90 per cent, burdock 93 per cent, jimson weed 95 per cent, ox-eye daisy 82 per cent, Canada thistle 21 per cent, and black mustard 25 per cent. The results of similar work by Duvel have been previously noted (E. S. R., 17, p. 556).

**Results of seed inspection, 1914, J. P. HELYAR and R. SCHMIDT** (*New Jersey Stas. Bul. 279 (1915), pp. 3-35*).—This bulletin tabulates the results of analysis of 443 unofficial samples and 455 official samples of seeds. The official samples included timothy, redtop, Kentucky and Canada blue grass, orchard grass, millet, meadow fescue, hard fescue, English rye grass, brome grass, red,

alsike, crimson, and white clover, alfalfa, and vetch. Comments are given on the official samples, and the methods of taking and sending samples to the seed laboratory are described. The text of the New Jersey seed law is included.

## HORTICULTURE.

**Subtropical vegetable gardening**, P. H. ROLFS (*New York: The Macmillan Co., 1916, pp. XVIII+309, pls. 16*).—A practical treatise on vegetable growing in subtropical countries. Although the subject matter is based primarily on Florida practice, the author has also drawn on the results of horticultural investigators in this country as well as on the horticultural literature of tropical countries.

The first or general part of the work discusses soils and manures for vegetable gardening in warm countries, fertilizers, rotation of crops in vegetable gardening, water and watering, seeds and seed sowing, planting, pests and diseases, and marketing. The succeeding chapters take up the various classes of vegetables with reference to their specific cultural treatment. Short reference lists are given of publications dealing with the more important vegetables.

**Vegetable culture**, H. A. VAN HERMANN and R. S. CUNLIFFE (*Estac. Expt. Agron. Cuba Circ. 51 (1916), pp. 75, figs. 18*).—This circular discusses the general principles of vegetable growing, and gives specific directions for the culture of various kinds of vegetables adapted for culture in Cuba.

**Cabbage**, J. C. C. PRICE and G. V. STELZENMULLER (*Alabama Col. Sta. Bul. 187 (1916), pp. 3-20, figs. 2*).—This bulletin gives the results of fertilizer experiments and variety tests with cabbage conducted under the direction of the station, together with general directions for growing cabbage based upon the experiments, and including notes on insects and diseases.

**Early peas tried at Wisley, 1915**, C. C. TITCHMARSH (*Jour. Roy. Hort. Soc., 41 (1915), No. 2, pp. 277-289, pl. 1*).—A report on varieties of garden peas under observation at Wisley in 1915.

**Factors affecting regular bearing in orchards**, J. E. GOURLEY (*Agr. Student, 22 (1916), No. 7, pp. 465-470, fig. 1*).—This article summarizes the results of experiments at the New Hampshire Experiment Station in plat tests of fruit trees with fertilizers, cultivation, mulching, liming, and cover crops; and of the effect of girdling and pollination, previously noted (*E. S. R., 33, p. 44*).

**Bridge grafting of fruit trees**, W. F. FLETCHER (*U. S. Dept. Agr., Farmers' Bul. 710 (1916), pp. 8, figs. 7*).—In this publication the author discusses the range of usefulness of bridge grafting and gives detailed instructions for bridge grafting. Suggestions are also given for the prevention of injuries by mice, rabbits, and borers, together with a list of Department publications relating to animals and insects that are likely to girdle trees.

**Pruning**, W. H. CHANDLER and H. B. KNAPP (*Cornell Reading Courses, 5 (1916), No. 104, pp. 73-96, figs. 27*).—A popular treatise on the methods of pruning various fruit trees and bushes.

**Apple and pear growing**, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul. 92 (1915), pp. 74, pls. 2, figs. 49*).—A practical treatise on the establishment and management of apple and pear orchards, including descriptions of varieties. A section on insect pests of the apple and pear, by W. W. Froggatt and W. B. Gurney (pp. 27-47), is also given.

**Grass mulch culture of apple orchards**, F. H. BALLOU (*Agr. Student, 22 (1916), No. 7, pp. 471-475, figs. 4*).—A popular summary of combined mulching and chemical fertilizer experiments in apple orchards being conducted at the Ohio Experiment Station.

As a result of these experiments it was found that by the judicious use of fertilizers on the thin orchard soils of the hilly sections of southeastern Ohio the vigor and fruitfulness of the trees is not only improved but the vegetation beneath the trees becomes transformed from a scanty wild growth of native weeds and poverty grass to an abundant growth of better grasses which, annually cut and allowed to remain as a soil covering, is rapidly proving a source of humus for the soil. No grass seed has been sown in any of these experiments.

The methods of propagation of the best varieties of perry pears, A. TRUELLE (*Les Modes de Propagation des Meilleures Variétés de Poiriers à Poiré. Argentan: Emile Langlois, 1915, pp. 11*).—In addition to a discussion of methods of propagation, a list is given of some 84 varieties of cider pears of French and of foreign origin, together with a selected list of 15 of the more important varieties, which includes analytical data showing the principal elements contained in a liter of juice of these varieties.

Report on the cooperative fertilizer experiments with cranberries at Whitesbog, Browns Mills, New Jersey, 1915, F. P. SCHLATTER (*Proc. Amer. Cranberry Growers' Assoc., 46 (1916), pp. 9-13, 15-19*).—A general summary is given of the results secured in 1915 in the cooperative fertilizer experiments with cranberries being conducted under the direction of the New Jersey Experiment Stations (E. S. R., 34, p. 150). The data secured from various plats are presented in tabular form and discussed.

Although no definite conclusions are drawn at this time, the results of the work for the three seasons show that fertilizers have given an increased yield in only one series of experiments, where the plats were located on a sandy soil. In one series, which is located on deep mud or muck bottom soil, fertilizers, excepting perhaps phosphorus-containing materials, have had a detrimental effect. Practically the same results were secured in a series of experiments conducted on a deep mud soil underlaid with bog iron ore.

The resistance of various gooseberry varieties against North American gooseberry mildew and their behavior on treatment with sulphur, G. KÖCK (*Die Widerstandsfähigkeit verschiedener Stachelbeersorten gegenüber nord-amerikanischem Stachelbeermehltau und ihr Verhalten bei der Behandlung mit Schwefel. Vienna: K. K. Pflanzenschutzstation [1914], pp. 4*).—The author enumerates some 100 varieties of gooseberries under observation and gives further lists of those which were subject to mildew attack and those which suffer from leaf fall upon being treated with sulphur.

Strawberry culture, F. W. JIMENEZ (*El Cultivo de la Fresa. Mexico: Govt., 1914, rev. and enl., pp. 27*).—A popular treatise on strawberry culture with special reference to Mexican conditions.

Note on some determinations on the grapes of French-American and American hybrid vines, F. C. TORNELLO (*Agr. Mod. [Milan], 22 (1916), No. 3, pp. 26-28*).—The author reports observations made on vines of six hybrid species, conducted in the antiphyloxera nursery at Cerignola. The data given show the yield of the different species, quality of the fruit, and relative proportion of the juice, must, and residue, as well as the sugar, acid, and alcoholic content of the must.

Muscadine grapes, G. C. HUSMANN and C. DEARING (*U. S. Dept. Agr., Farmers' Bul. 769 (1916), pp. 28, figs. 29*).—A treatise on the Muscadine grapes with reference to their botanical relation and classification, propagation, soils, planting, companion crops, cultivation, fertilization, pollination, pruning and training, harvesting and handling, yields and returns, uses, insect enemies and diseases, breeding investigations, and general descriptions of the leading varieties.

As a result of the breeding investigations already conducted by the Department some valuable seedlings have been secured. One lot of 49 seedlings has been produced in which over 50 per cent are perfect flowered and self-fertile, there being no sterile male seedling in this lot. The progress thus far made with this lot suggests that it is only a matter of time when self-fertile varieties with greater yields than the present varieties will be produced. A number of promising hybrids between Muscadine and American Euavitis and between Muscadine and Vinifera grapes have also been produced.

**The raisin industry**, G. C. HUSMANN (*U. S. Dept. Agr. Bul. 349* (1916), pp. 15, pls. 9, figs. 3).—An account of the raisin industry in the United States, in which consideration is given to the origin, growth, and fluctuations in the industry, soils adapted for raisins, preparation of soils, pruning methods, raisin varieties, climatic conditions, harvesting and preparing the crop, dipping and scalding raisins, packing raisins, and classes of raisins.

**[Varieties of the avocado]**, F. O. POPEÑO (*Cal. Citrogr.*, 1 (1915), No. 3, pp. 14, 33; 1 (1916), Nos. 4, pp. 12, 13, 24, figs. 3; 5, pp. 8-10, figs. 4).—An exposition on the varieties of the avocado, including a descriptive list of the varieties which was prepared for the California Avocado Association.

**Study on the chayote (*Sechium edule*)**, D. A. HERRERA (*Bot. Dir. Gen. Agr. [Mexico]*, 5 (1915), No. 2, pp. 135-143).—In this article the author discusses the chayote with reference to its botany, chemical composition, culture, and uses.

**Features of the grapefruit in California**, A. D. SHAMEL (*Cal. Citrogr.*, 1 (1916), Nos. 5, pp. 19, 20, figs. 2; 6, pp. 3, 13, fig. 1).—A paper on this subject in which the author reviews the grapefruit situation in California. Information is given relative to varieties, distribution of plantings, relation of composition and other characteristics to the quality, comparative analyses of Florida and California grapefruit, and analyses of representative types of California-grown Marsh Seedless grapefruit during the ripe period.

**The consumer's dollar working backwards**, G. H. POWELL (*Ann. Conv. Nat. League Com. Merchants U. S.*, 24 (1916), pp. 89-91, figs. 5).—An economic discussion of the methods and cost of distributing citrus fruit, with special reference to the California citrus fruit crop.

**Seed gardens** (*Dept. Landb., Nije. en Handel [Dutch East Indies], Meded. Proefstat. Thee*, No. 39 (1915), pp. 24, pls. 3).—This pamphlet contains the following articles: Report on a Study of the Tea Seed Gardens in Cachar and Sylhet, by A. S. Tunstall, translated by C. Bernard (pp. 1-14), and Some Observations on Tea Gardens in Java, by C. Bernard (pp. 15-24). These articles contain information relative to the care and management of the tea seed gardens with special reference to the pruning and training of seed trees and insect pests and diseases and their control.

**Fertilizer experiments at Malabar, II**, K. A. R. BOSSCHA (*Dept. Landb., Nije. en Handel [Dutch East Indies], Meded. Proefstat. Thee*, No. 37 (1915), pp. 13).—A further report on fertilizer experiments with tea plants conducted at Malabar (E. S. R., 32, p. 46). A brief note on the productive possibilities of the tea plant, by A. E. Reijntj (pp. 11-13), is also included.

**The production and commerce of nuts in Asia**, M. and L. RIGOTARD (*Vie Agr. et Rurale*, 6 (1916), No. 10, pp. 175-178, figs. 2).—This article is essentially a comparative study of French and Asiatic varieties of walnuts with special reference to their commercial importance.

**Experiments in forcing the lily-of-the-valley by means of the warm water process**, G. A. LANGER (*Möller's Deut. Gärt. Ztg.*, 30 (1915), No. 50, pp. 398-401, figs. 7).—In 1914 experiments were conducted with a large number of lily-of-the-valley plants which were treated by the warm bath process (E. S. R.,

27, p. 842), the various temperatures ranging from 25 to 45° C. (77 to 113° F.), and for 5- and 10-hour periods. The warm water bath was applied to some lots of plants as early as November 25 and to others as late as February 22.

Summing up the data secured from the various tests, the author finds that the advantage of the warm water process for early forcing has been proved beyond doubt. The temperature of the water and the duration of the bath varies with the time the plants are to be forced. For early forcing the temperature should range from 35 to 38° and the bath should be continued for a 10-hour period, or with a temperature of 40° an immersion period of only 4 or 5 hours is necessary. Later in the season the temperature may be reduced from 32 to 35° and the immersion period continued for about 5 hours. In the present experiments the warm water bath applied after the middle of February appeared to be not only superfluous but to do some damage.

Generally speaking, it is not necessary to immerse the plants for as long a time after a wet or cold summer as after a dry and warm summer. Plants from heavy soils are more susceptible to treatment than plants from light sandy soils, and large plants react more favorably than small plants. In all cases it is necessary to maintain the water at the proper temperature throughout the time of the bath.

[Phloxes and pyrethrums at Wisley, 1915], C. C. TITCHMARSH (*Jour. Roy. Hort. Soc.*, 41 (1915), No. 2, pp. 250-276).—This comprises a report on several hundred varieties of phlox and pyrethrums under observation at the Wisley Gardens during 1915.

House and window plants, D. Bois (*Les Plantes d'Appartement et les Plantes de Fenêtres*. Paris: J. B. Baillière & Sons, 1916, 2. ed., rev. and enl., pp. 443, figs. 219).—Part 1 of this work deals with the general principles of culture as applied to house and window plants. Part 2 contains a descriptive list of plants suitable for windows and balconies, including specific cultural directions, and part 3 takes up in a similar manner the plants suitable for culture in the house. Part 4 contains classified lists of the plants, with special reference to their light requirements and value for foliage, flowers, and decorative purposes.

Fertilizing lawn and garden soils, P. E. BROWN (*Iowa Sta. Circ.* 24 (1916), pp. 3-15).—This circular discusses the preparation of lawn soils, fertilization, seeding, subsequent fertilization, and renovating lawns. Information is also given relative to the use of fertilizers and green manure crops for the vegetable garden.

The North Dakota farmstead, its arrangement and adornment, H. O. WERNER (*North Dakota Sta. Circ.* 10 (1916), pp. 62, figs. 51).—In this circular the author discusses the location of the farmstead site and the arrangement of farm buildings and grounds, together with the development of the farmstead from an ornamental point of view. A descriptive list is given of trees, shrubs, vines, hardy perennials, and annual plants suited for North Dakota conditions, together with detail plans of farmsteads with lists of plant materials suggested. Directions are also given for the culture and care of trees and shrubs.

Gardeners' and florists' annual for 1916, edited by J. H. DICK (*New York: A. T. De La Mare Printing & Publishing Co., Ltd.*, 1916, pp. 231, figs. 21).—This work contains a digest of the events of the horticultural year in this country and abroad, including the activities of the national societies, a summary of law cases affecting the trade, biographies of leading horticulturists, special articles, and miscellaneous notes and information dealing with gardening and floriculture.

## FORESTRY.

**Laws, decisions, and opinions applicable to the National Forests**, compiled by R. F. FEAGANS (*U. S. Dept. Agr., Office Solicitor, Laws, Decisions, and Opinions Applicable to the National Forests, 1916, pp. 151*).—This comprises a compilation of laws and parts of laws of a general nature affecting the administration and protection of the National Forests, with citations to acts of special or local application, and references to the more important decisions of the courts, the Interior Department, the Attorney General, the Comptroller of the Treasury, and the Solicitor of the Department of Agriculture.

**Seventh annual report of the state forester.—Forestry in Vermont, A. F. HAWES** (*Ann. Rpt. State Forester Vt., 7 (1915), pp. 55, pls. 6*).—This report includes a description of some of the more interesting examples of forestry throughout the State, together with an account of nursery planting operations for the year and activities on the different State forests. A brief note is given on white pine blister rust inspection for 1915. A report on forest fires in 1914 by R. M. Ross and a report on an examination made by B. A. Chandler on land willed to the United States Government are also included.

**Eighth annual report of the Washington Forest Fire Association, 1915** (*Ann. Rpt. Wash. Forest Fire Assoc., 8 (1915), pp. 20*).—A report of the activities of the association for the year 1915 in the protection of some 2,586,409 acres of forests from fire.

**Report of committee on forestry, Hawaiian Sugar Planters' Association, for the year ended September 30, 1915, L. A. THURSTON** (*Honolulu: Hawaiian Gazette Co., Ltd., 1915, pp. 22*).—This report contains short reports by C. S. Judd (pp. 6-14), D. Forbes (pp. 15-20), and L. von Tempsky (pp. 21, 22), in which consideration is given to the desirability of forest protection and forest extension for the conservation of water and the protection of watersheds, the prevention of sand or dust drifting, and the production of the major and minor forest products. Lists are given of trees suitable for these various purposes in Hawaii.

**The Eberswalde forest-seed testing station and the methods of testing the seeds, SCHWAPPACH** (*Ztschr. Forst u. Jagdw., 47 (1915), No. 11, pp. 631-651, fig. 1*).—A descriptive account of the seed-testing work of the Eberswalde seed-testing station.

**Progress report of forest administration in Baluchistan for 1914-15, MULRAJ** (*Rpt. Forest Admin. Baluchistan, 1914-15, pp. 6+11+28*).—The usual progress report of the administration of the state forests of Baluchistan, including data relative to alterations in areas, forest surveys, working plans, forest protection, revenues and expenditures, etc., for the year 1914-15.

**Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1914-15, H. H. HAINES** (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1914-15, pp. 11+52+5*).—A report similar to the above relative to the administration of the state forests of the Province of Bihar and Orissa for the year 1914-15.

**Annual administration report of the forest department of the Madras Presidency for the twelve months ended June 30, 1915, A. W. LUSHINGTON, S. COX, P. M. LUSHINGTON, C. D. MCCARTHY, ET AL.** (*Ann. Admin. Rpt. Forest Dept. Madras, 1915, pp. 81+LXXII+18*).—This comprises separate reports on the administration of the state forests in the Northern, Central, Southern, and Western Circles of the Madras Presidency, together with a summarized report on the administration of the forests in the Presidency as a whole. Data relative to alterations in forest areas, forest surveys, protective and miscellaneous

work, yields in major and minor forest products, revenues, expenditures, etc., are included in tabular form.

**Progress report on forest administration in the Northwest Frontier Province for the year 1914-15.** W. MAYES (*Rpt. Forest Admin. Northwest Frontier Prov., 1914-15*, pp. 4+11+14+XXIV).—A report similar to the above relative to the administration of the state forests of the Northwest Frontier Province for the year 1914-15.

**Report of the department of forestry for the year ended June 30, 1915.** R. DALRYMPLE-HAY (*Rpt. Forestry Dept. N. S. Wales, 1915*, pp. 6, pls. 6).—This is the usual progress report relative to the administration and management of the state forests and forest nurseries of New South Wales, including information relative to afforestation work, alterations in forest areas, imports and exports of timber, revenues, expenditures, etc.

**The native and cultivated forest trees and shrubs of the Missouri River basin.** L. H. PAMMEL, G. B. MACDONALD, and H. B. CLARK (*Proc. Iowa Acad. Sci.*, 22 (1915), pp. 23-56, pls. 12).—In this paper the authors present a catalogue of trees and shrubs of the Missouri River basin in western Iowa and eastern Nebraska. Introductory considerations deal with the topography and soils of the region, the range and ecological distribution of trees in the area surveyed, and the origin of the tree flora.

**A mill scale study of western yellow pine.** H. E. MCKENZIE (*Cal. Bd. Forestry Bul.* 6 (1915), pp. 171, figs. 222).—The study here reported is based upon 919 trees ranging from 20 to 44 in. in diameter breast-high. A complete analysis of the quality and quantity of lumber produced from these trees, also from the butt logs (the best part) and the top logs (the poorest part of the trees) was made. The measurements secured in this work are here presented, together with deductions made therefrom, in a series of curves and tables with a view to throwing some light on the lumbering value and the best time to cut trees of various sizes.

**Colonial plants.—Latex and resin yielding plants.** H. JUMELLE (*Les Cultures Coloniales.—Plantes à Latex et à Résines*. Paris: J. B. Baillière & Sons, 2. rev. ed., vol. 7, 1915, pp. 119, figs. 41).—This is part 7 of the author's revised work (see p. 829). The present part discusses various rubber and resin yielding plants with reference to their botany, exploitation, culture, and utilization.

**[Papers on rubber culture and the rubber industry] (Introductory Papers Internat. Rubber Cong. Batavia, 1914, pp. [191], fig. 1).**—This comprises some 21 papers on various phases of rubber culture and the rubber industry, which were prepared for the International Rubber Congress and Exhibition at Batavia in September, 1914. Certain of the present papers are classed as introductory papers and others as papers prepared for but not included in the rubber book issued by the congress (E. S. R., 33, p. 50).

**Manurial experiments with young rubber at Kuala Lumpur.** F. G. SPRING (*Agr. Bul. Fed. Malay States*, 4 (1916), No. 4, pp. 105-110).—Data are given on the fourth season's results with various combinations of lime, nitrogen, phosphorus, and potash (E. S. R., 32, p. 339).

The fertilizers in this experiment were applied at the beginning of the first and third years. They appeared to have had a stimulating effect as regards growth for about a year after each application. After this there seemed to be a slight reaction as compared with the control plots. Over the whole 4-year period the total increase in the manured plots in every case exceeded that of the controls. No definite conclusions are to be drawn until the trees are tapped.

**The natural reproduction of sal**, R. S. TROUP (*Indian Forester*, 42 (1916), No. 2, pp. 57-60).—Experiments conducted by the author show that in the open, exposed to the sun, the seed of sal (*Shorea robusta*) falling on a layer of dead leaves fails to germinate or, if it does germinate, perishes rapidly. Under shade with complete protection from the sun the seed falling on a layer of dead leaves germinates and the seedlings develop satisfactorily above ground during the first rainy season. Relative to the root system, however, unless the leaf layer is so scanty as to permit of the ready penetration of the taproot to the mineral soil, the roots spread horizontally along the moist leaves and perish in the ensuing dry season. These results suggest that the annual layer of fresh dead leaves may be a highly adverse factor so far as natural reproduction is concerned.

**Anatomical investigations on the formation of annual rings of *Tectona grandis***, F. GEIGER (*Jahrb. Wiss. Bot. [Pringsheim]*, 55 (1915), No. 4, pp. 521-607, figs. 28).—A study of annual ring formation of teak woods secured from different sections of east and west Java. Data are given and discussed showing the variation in the formation and distribution of the elementary organs in the different specimens, with special reference to structure in the region of growth.

A bibliography of related literature is appended.

**Reproduction of teak by root suckers**, E. MARSDEN (*Indian Forester*, 42 (1916), No. 2, pp. 43-50, pls. 6).—Experiments reported by the author indicate that the so-called root suckers of teak are really "stool shoots" and that true root suckers are comparatively rare, these being usually confined to a few shoots which originate near the head of the roots, close to the parent stem.

**Teak working plans in Burma**, H. W. A. WATSON (*Indian Forester*, 42 (1916), No. 1, pp. 4-17).—In this article the author discusses the past working plans and the probable trend of future working plans, including suggestions for their development.

**An investigation relative to the most exact method of measuring teak trees and teak stands**, H. BEEKMAN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Boschv.*, No. 1 (1915), pp. VII+93, pls. 26).—This comprises a report on a comparative study of methods of estimating age, diameter, height, and volume growth, with special reference to teak trees and teak forests. The data secured are presented in a series of diagrams and tables and fully discussed.

**The care and improvement of the woodlot**, C. R. TILLOTSON (*U. S. Dept. Agr. Farmers' Bul.* 711 (1916), pp. 24, figs. 6).—This bulletin discusses the essentials of a good woodlot and its improvement, care, and methods of regeneration.

**Marketing of woodlot products in Kentucky**, W. D. STERRETT (*Bien. Rpt. State Forester Ky.*, 2 (1915), pp. 71-140, pls. 24).—In this paper the author briefly surveys the woodlot situation in Kentucky; gives an account of the woodlot regions, wood-using industries, and how the different species are used; and discusses the methods of increasing the profits from woodlot sales and of preventing the deterioration of cut woodlot products. A directory of wood-using firms is included.

**Utilization of southern wood waste**, A. D. LITTLE (*Chem. Engin.*, 23 (1916), No. 2, pp. 83-86).—An address on this subject delivered before the eighth annual meeting of the American Institute of Chemical Engineers in January, 1916, in which the author gives special attention to the various methods of utilizing wood waste in longleaf yellow pine.

**Wood flour**, F. W. KRESSMANN (*Metallurg. and Chem. Engin.*, 14 (1916), No. 7, pp. 372-374).—A discussion of the nature, properties, and uses of wood flour.

## DISEASES OF PLANTS.

The International Phytopathological Convention of Rome and its relation to tropical agriculture, A. G. L. ROGERS (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), pp. 109-117).—A brief abstract is given of this paper, which dealt with the history of the movement in favor of international action for control of plant diseases, the congress at Rome in 1914, the inadequate representation of tropical countries, a summary of legislation and regulations at present in force in tropical and subtropical countries, a comparison of these regulations with those contemplated by the Rome convention, and the advantages and disadvantages of the proposed change of method. The discussion which followed the paper is also reported.

Vegetable pathology, D. BOIS (*Rev. Hort. [Paris]*, 87 (1915), No. 19, pp. 404, 465).—The author describes briefly the organization of the Société de Pathologie Végétale, which held its first meeting in Paris in February, 1914, listing the officials chosen thereby and noting the main contents of its first bulletin.

[Effect of meteorological conditions on development of plant diseases], G. DOKOGIN (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 3-9, fig. 1).—It is announced by the author that hereafter the Bureau of Mycology and Phytopathology of the Russian Department of Agriculture will make a special study of the meteorological conditions of the Petrograd region in their relation to the development of plant diseases. In order to secure accurate data this study will extend over a period of many years. Tables showing cloudiness, rainfall, depth of snow layer, soil and atmospheric temperature, atmospheric pressure, reiteration and strength of winds, and certain other factors will be compiled quarterly and published in this journal. The first table, covering the winter months of 1914-15, is given with this article.

The genus *Fusarium* in plant pathology, G. GANDARA (*Mem. y Rev. Soc. Cient. "Antonio Alzate"*, 32 (1913), No. 9-10, pp. 415-426).—The author gives the results of an examination attempting to determine the really pathological species of *Fusarium* so far as plants are concerned, the known synonymy of the same, and the hosts attacked by preference in each case.

An Asiatic species of *Gymnosporangium* established in Oregon, H. S. JACKSON (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 22, pp. 1003-1010, pls. 2).—A detailed account is given of investigations conducted by the author, while connected with the Oregon Experiment Station, on *G. koreanse*, a preliminary note of which has already been given (*E. S. R.*, 34, p. 352).

*Pyrenochaeta elodeae* n. sp., V. ORSHANSKAIA (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 35-37, figs. 2).—The above species was isolated by the author from *Elodea densa*, the leaves and stems of which were affected by this parasite and turned yellowish instead of normal bright green. The host tissue was found to be permeated with the fungus mycelium, which was also growing in flakes on the surface of the plant. A technical description of the fungus is given.

*Rhizoctonia crocorum* and *R. solani* (*Corticium vagum*), with notes on other species, B. M. DUGGAR (*Ann. Missouri Bot. Gard.*, 2 (1915), No. 3, pp. 403-458, figs. 9).—The author presents an account of investigations on *Rhizoctonia* as a cause of disease in plants, especially of those carried out since the appearance of his own earlier work with Stewart (*E. S. R.*, 13, p. 55).

The view that the *Rhizoctonia* forms on crocus, alfalfa, and some other hosts belong to a single morphological species is confirmed. The correct name of the violet root fungus, so long as a spore stage remains uncertain, is held to be *R. crocorum*. This is known in a few localities in America and widely in

Europe. It attacks plants in many families, but mainly dicotyledons. Large sclerotia are observable in connection with crocus and alfalfa. The existence of distinct forms or races of this species requires further investigation. The organism has not yet proved to be culturable by the usual laboratory methods, and the evidence collected is still insufficient to identify the perfect form.

*R. solani*, which is readily distinguishable from the above, is said to be widely distributed in America and elsewhere on potato. The other host plants represent many families, *Asparagus sprengeri* being the only monocotyledonous host yet reported. The types of disease caused by this species are very diverse, damping off and root and stem rots being the most important direct effects. The organism is readily culturable by the usual laboratory methods. The perfect stage is thought to be *C. vagum*.

Contrasted descriptions are given of these two fungi, with notes on other species, some of which are considered as having insufficient affinities to be included in the genus *Rhizoctonia*.

A bibliography is appended.

Notes on plant parasitic nematodes, L. P. BYARS (*Abs. in Science, n. ser.*, 43 (1916), No. 1102, p. 219).—Attention is called to the general characteristics of nematodes and to the economic importance and present distribution of the bulb and stem infesting nematode, *Tylenchus dipsaci*; *T. tritici*, a parasite of wheat kernels; *Aphelenchus armirodis*, a violet bud organism; and *Heterodera radicum*, a gall-forming nematode on a number of plants.

[Plant diseases in Barbados], J. S. DASH (*Rpt. Dept. Agr. Barbados, 1913-14*, pp. 43-45).—It is stated that *Colletotrichum falcatum*, the cause of sugar cane red rot, was rarely met with during 1913-14, but *Marasmius sacchari*, the cause of a root disease of cane, appeared as usual. *Thielaviopsis ethacetica*, which attacks cane cuttings principally, was severe in several places. It can be controlled, it is said, by passing the cuttings through Bordeaux mixture just before planting.

A banana disease may be connected with the presence of a *Fusarium* and a *Gloeosporium* on the diseased portions. Insufficient nutrition and inferior living conditions generally may render the trees susceptible to these fungi.

Specimens of diseased tomato showed two diseases, one a leaf mold (*Cladosporium fulcum*), the other a fruit anthracnose due to a *Gloeosporium*.

Grape mildew (*Oidium tuckeri*, *Uncinula spiralis*) was successfully treated with flowers of sulphur and lime in the form of a powder.

A dieback of cassava, ascribed to a *Gloeosporium* (possibly *G. manihoti*), may be controlled, it is thought, by care in the selection of cuttings and soaking them in Bordeaux mixture just before planting.

*Ectypa crumpeus* is said to have caused a loss of *Ficus nitida*.

Cultivated snapdragon (*Antirrhinum* sp.) showed evidences of a disease of the roots and of the stem near the ground, from the fructifications of which a *Colletotrichum* could be developed. This is said to be somewhat different from *C. antirrhini* described by Stewart (*E. S. R.*, 12, p. 1055) as causing anthracnose of snapdragon. Use of seed for propagation is advised.

[Plant pests and diseases in Grenada], J. C. MOORE (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1914-15*, pp. 7, 8, 19).—A report of Ballou and Nowell, besides giving information regarding animal pests, records the discovery of root diseases due to three species of *Rosellinia*. Two of these were found attacking cacao, one in wet, the other in drier situations. The third form, *R. bunodes*, was observed on hibiscus in the interior of the island.

In another part of the report, brief notes are given on thread blight of cacao and nutmegs, also canker, pod brown rot, and dieback of cacao.

[Work of the Bureau of Mycology and Phytopathology], A. IACHEVSKII (JACZEWSKI) (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 48-52).—This is a general outline of the main problems on which the members of the bureau staff are working at the present time.

Of particular interest is a peculiar disease of cereals known in Russia as "drunk bread." This is attributed to the action of certain fungi, and results in general intoxication of the population when affected grains are used for food. The disease occurs from year to year in eastern Siberia and also occasionally in northern and central European Russia. Pathological as well as chemical investigations are under way, and preliminary reports are already in print.

Rusts are considered another serious pest of cereals. Work along this line is concentrated chiefly on selecting and breeding disease resistant varieties. Results of the previous two seasons' work will soon be published.

In regard to smuts, attention is directed toward simplifying and improving various methods of seed treatment. Contrary to the opinion of some practical men, the exposure of smut spores to a temperature of from 20 to 24° C. for a long time did not affect their ability to germinate.

Club root of cabbage is said to cause immense losses, especially in suburban gardens of Petrograd. A thorough study was made during the past three years on the life history of the causal organisms, means of infection, host relations, and means of control.

Much attention has been devoted to testing various fungicides, and the results of the experiments are fully in favor of lime and sulphur compounds as substitutes for Bordeaux mixture and other mixtures of copper salts. Root gall of nursery stock, American gooseberry mildew, and fungus diseases of insects are the remaining three problems mentioned in the outline.

An investigation of the mycological flora in Astrakhan, S. SHEMBEL (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, pp. 7-41, figs. 23).—The author gives an account of fungus diseases observed during the summer of 1913 in the Province of Astrakhan, Russia, chiefly in the vicinity of the city of Astrakhan.

The number of cryptogamic parasites in that particular season was not very great, but the area affected and the degree of infestation were quite serious. Most prevalent appeared to be members of the family Erysiphaceae, frequently attacked by a parasite of the genus *Cicinnobolus*, and various rust fungi. Among the latter is mentioned *Uromyces alhaginis* n. sp. on leaves and stems of *Alhagi camelorum*. On the same host the author found also an undescribed species of *Septoria* which he named *S. alhaginis*, and another new fungus on *Euphorbia esula* named *Leptothyrium caspicum* n. sp.

Grapes suffered more than any other cultivated plant, due to a severe attack of mildew (*Plasmopara viticola*), from 50 to 70 per cent of the fruit being affected. Spraying with Bordeaux mixture before the blossoming period gave almost perfect control of this disease, while omission of this spray resulted in the loss of the largest part of the crop. Two applications of Lazurin (a prepared Bordeaux mixture) on May 23 and July 3 at the rate of about 4½ lbs. to 21½ gal. water, with the addition of the dusting of the blossoms with sulphur, practically freed the plants from the fungus. In the same experiment, polysulphids and insecticides alone did not check the development of the disease.

[Report of the plant pathologist], I. E. BARBARIN (*Otchet Mikol. Kab. Sal-girsk. Opytn. Plod. Sta.*, 1913-14, pp. 14).—A brief account is given of the work carried on at the Salgir Experiment Station since its organization in 1913. The diseases studied included a supposedly nonparasitic spot of apple fruit known in Germany as Stippigkeit; the so-called dry spot of apple leaves; pink

spot of watermelons due to *Glauosporium lagenarium*, which is very widely spread in the Crimea; and wheat rust caused by *Puccinia glumarum*, with particular reference to the possibility of its transmission with the seed.

In testing various fungicides, it was found that a proprietary compound known as Mortus was most effective against apple scab and American gooseberry mildew (*Sphaerotheca mors-uvæ*). The composition of Mortus is unknown, but chemical analysis showed the presence of sodium and arsenic, and some evidence was obtained that the effectiveness of the compound is due to the latter element. Laboratory tests with germinating spores of *Monilia fructigena*, *S. humuli*, *Trichothecium roseum*, *Penicillium* sp., and others showed that germination was retarded in a solution of  $\frac{1}{2}$  gm. sodium arsenite in 3 liters of water, and that it ceased entirely in a solution of twice this strength. More extended experiments are to be carried on in the future.

**Observations on parasitic fungi in the Province of Podolsk.** M. E. DOBROVOT'SKIĬ (Zhur. Bol'šei Rast., No. 4-5 (1914), p. 139; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 1, pp. 74, 75).—Among the fungi collected by the author in the Province of Podolsk in 1912, some are reported on new hosts, among which are *Tilletia controversa* on *Triticum vulgare*, *Venturia inaequalis* on *Pyrus prunifolia*, and *Rhytisma punctatum* on *Acer ginnale*. The author also describes *Ascochyta cardiaceæ* n. sp. from *Leonurus cardiaca*.

[Report on plant diseases], F. A. STOCKDALE (In Summary of Investigations Made During the Period January 1 to June 30, 1915. Mauritius; Dept. Agr., 1915, pp. 1, 2).—Three manifestations are described from different localities of what appears to be a physiological disease resulting in the production of a gummy substance in the tissues of the sugar cane plant. The leaf and stem disease of cassava due to *Glauosporium manihotis* has again been prevalent in some sections, local varieties suffering more than those recently introduced. The local variety of pistachio appears to be more resistant than imported ones to a leaf spotting disease caused by a species of *Cercospora*.

*Phytophthora infestans* was common on potatoes and tomatoes in some localities late in June. Its control, where dews are heavy, appears to be more difficult in this region than in Europe. Attempts are being made to hybridize locally resistant varieties with standard European varieties of tomatoes.

**Duration of resistance of plants and insects to hot water** (Rev. Sci. [Paris], 53 (1915), I-II, No. 17, pp. 465, 466).—In connection with the mention of tests on the resistance of insects to hot water in view of the present high price of chemicals, it is said to have been found by Gaston and Vermorel that grapevines were uninjured by a hot water temperature of 45° C. (113° F.), but that young leaves were killed by a temperature of 50° in 6 minutes and 52° in 1 minute.

**Burgundy mixture as a substitute for Bordeaux mixture.** W. NOWELL (Agr. News [Barbados], 14 (1915), No. 355, p. 398).—The difficulty experienced in securing quicklime for Bordeaux mixture in some of the West Indies having resulted in the employment of slaked or partly slaked lime in this application and in the preparation therefrom of an inferior spray for fungicidal purposes, attention has been directed to Burgundy mixture. This is said to have yielded excellent results in experiments referred to, showing advantages even where good lime is available. Several formulas are given, with directions for mixing and testing.

**Fungicide experiments, 1914.** G. P. DARNELL-SMITH (Agr. Gaz. N. S. Wales, 26 (1915), No. 6, pp. 494, 495).—The results of these and previous experiments are claimed to show that the safest treatment thus far tested, as regards germinability and freedom from bunt, is immersion of the seed wheat for three minutes in 1.5 per cent copper sulphate solution and then for an equal period in lime water.

[Potassium permanganate treatment for seed grains], K. L. EGERT (*Selsk. Khoz.*, 1914, pp. 1343-1346; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 66).—The author obtained a perfect control of wheat smut by soaking seed  $\frac{1}{2}$  hour in potassium permanganate solution at the rate of about  $\frac{1}{2}$  oz. to 3 gal. of water. A solution practically 10 times stronger than this did not affect the germinating power of the grain. This treatment, according to the author, is less expensive than the usual formalin method, and, besides, the seed thus treated is not attractive to birds on account of a black color which it takes on in soaking.

Blight in maize (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 5, p. 388).—Reports sent in by officials are said to indicate that a leaf blight of maize, due to a *Helminthosporium*, causes severe loss in localities where heavy rainfall and hot steamy weather continue for some time. The trouble is apparently augmented by the continuous growing of maize on the same land year after year. Rotation and the use of leguminous crops for green manuring are recommended.

Flower-bud and boll shedding of cotton in the Ilorin Province, Nigeria, T. THORNTON (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), pp. 331-335).—This is an abstract of an account, with discussion, of observations made on both exotic and native cotton as regards one of the most serious drawbacks to its cultivation in that section.

High relative humidity, cloudy weather, and rain usually produced very severe losses. During the wet period the buds and bolls only were dropped, but not long after the establishment of the dry season an increased shedding of these was accompanied with a loss of leaves. Partial recovery later usually resulted in the production of new leaves and blooms, and a little rain falling in this period may result in a fair crop.

*Helminthosporium turcicum*, I. ZHAYORONKOVA (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, pp. 42-50, figs. 7).—This is an account of studies upon the effects of various culture media and temperatures on the growth of this organism, which the author isolated from diseased maize leaves.

The cultures were started in Van Tieghem moist cells and then transferred to nutrient media. The best growth was obtained on grains of maize and rice, and especially on bread. Gelatin appeared to be completely liquefied after three weeks. In regard to the temperature, growth began one or two days earlier and the mycelium developed more luxuriantly and densely at 25 to 30° C. than at 15 to 16°.

Crown gall of mangels (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt.* 1914, p. 31, pl. 1).—Several specimens of roots showing crown gall due to *Bacterium tumefaciens* have been received from Warwickshire and Shropshire. The disease is said to be increasing in importance, as numerous kinds of plants are attacked, including beet, potato, hop, tobacco, apple, and most other fruit trees, roses, and chrysanthemums.

Wart disease, G. T. MALTHOUSE (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt.* 1914, pp. 27-29, pl. 1).—A report is given of the 1914 potato tests for resistance to *Synchytrium endobioticum*, 11 varieties and 2 seedlings not previously tested being listed as immune thereto.

It is stated that since the first variety tests were commenced in 1900, 360 varieties and seedlings have been tested. Of these, 90 were of continental or South American origin and 31 have proved to be immune, while of the 270 of British or North American origin only 63 have proved to be immune. About 23 varieties are listed which are considered to be the most desirable and readily obtainable.

Tests with formalin showed no perceptible difference in degree of attack.

Further examination of material previously studied has shown that the resting stage of *S. endobioticum* is not of common occurrence.

**Beet tumors.** J. PEKLO (*Ztschr. Zuckerindus. Böhmen*, 39 (1915), No. 5, pp. 204-219, figs. 5).—The author describes the tumors resulting from the inoculation of sugar beet with *Bacterium beticola*, obtained for this purpose from Smith after his discovery of this organism (E. S. R., 25, p. 243). *B. tumefaciens* was also used to inoculate various plants. The results, such as tumor formation, infection strands in stems, etc., are discussed, with emphasis on the similarities between the results as shown in beets, for example, and those in animals and human beings.

**Relation of stomatal movement to infection by *Cercospora beticola*.** VENUS W. POOL and M. B. MCKAY (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 22, pp. 1011-1038, pls. 2, figs. 6).—The results are given of a study of leaf infection of the sugar beet caused by *C. beticola*.

Infection was found to be determined by certain morphological and environmental factors which influence stomatal activity. Among the factors concerned in the movement of stomata are leaf maturity, light, temperature, and relative humidity. Infection, both artificial and natural, was found to occur best on mature leaves and to be influenced by the rapidity of germ tube growth, maturity of leaves, and stomatal movement. Penetration of the leaf by the conidial germ tubes of *C. beticola* has been observed to occur only through open stomata, and consequently it is thought that infection probably takes place during daylight hours. As soon as penetration of the germ tube occurs, an attempt is made by the leaf cells to isolate the invading organism, but when this is not possible the fungus grows and produces a well-defined leaf spot.

**A fungus of uncertain systematic position occurring on wheat and rye.** P. J. O'GARA (*Science*, n. ser., 43 (1916), No. 1099, pp. 111, 112).—A report is given of a fungus which is found attacking the heads of wheat and rye some time before they emerge from the leaf sheaths. Often the heads are said to be so severely attacked that they do not emerge but remain permanently within the sheath. The organism has been isolated and grown in pure cultures, but its identification has not been fully determined.

**Fungus diseases of wheat.** G. P. DARNELL-SMITH and E. MACKINNON (*Dept. Agr. N. S. Wales, Farmers' Bul.* 102 (1915), pp. 3-31, figs. 28).—This consists of information and suggestions regarding control, as condensed from various sources, relating to fungus diseases of wheat in New South Wales. These include bunt or stinking smut (*Tilletia tritici* or *T. levis*), loose smut (*Ustilago tritici*), flag smut (*Urocystis tritici*), rusts (*Puccinia graminis* and *P. triticea*), mildew (*Erysiphe graminis*), take-all (*Ophiobolus graminis*), ergot (*Claviceps purpurea*), and blight associated with several species of *Septoria*. A form of contortion described is attributed to insect attack or to disproportionate growth in two different directions.

**Seeding time and attack by stinking smut.** J. ARPT. (*Ztschr. Landw. Versuchs. Österr.*, 18 (1915), No. 3, pp. 45-54).—Results are given of studies on the influence of fungicidal treatments of seed wheat on subsequent attack by stinking smut, and also on the effects of seeding time and weather in this connection.

It is stated that the germination of wheat seed at the temperatures prevalent during the early part of October results in a higher percentage of attack by stinking smut than does that of seed planted earlier. By planting after October 30, however, the percentage of attack was diminished, owing probably to the fact that the fungus germinates at a somewhat higher minimum temperature than the seed, thus permitting the cereal to pass its period of greatest susceptibility comparatively free from attack.

It is thought probable, however, that soil moisture is a more important factor in attack by stinking smut than is the temperature during the germination of the seed.

**A Phoma disease of western wheat grass**, P. J. O'GARA (*Science*, n. ser., 43 (1916), No. 1099, pp. 110, 111).—A preliminary account is given of a Phoma disease of *Agropyron smithii*, a more extended account of which is promised for a later publication.

**Gummosis, or the gumming of fruit trees**, G. P. DARNELL-SMITH and E. MACKINNON (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 5, pp. 405-410).—The authors give a brief historical survey, with notes on reports by several investigators, dealing more particularly with that of Butler (E. S. R., 24, p. 746).

While various causes and remedies are discussed, the general conclusion is reached that the one great measure, at once remedial and preventive in this connection, is proper attention to drainage.

[*Venturia inaequalis* and *V. pirina* in pure cultures], S. P. NOVOUSPENSKIĖ (*Zhur. Bol'znyi Rast.*, No. 4-5 (1914), p. 130; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 61).—The author briefly states that the apple scab fungus and the pear scab fungus are readily distinguishable in pure cultures by the color of their mycelium and the character of their growth. He also reports his observations on the development of apple scab in storage, the incubation period being only five days.

[*Fusicladium pirinum* in pure cultures], G. TACHEVSKIĖ (JACZEWSKI) (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 57-60, figs. 3).—Growth of the pear scab fungus (*F. pirinum*) in the author's studies appeared to be normal on gelatin as well as on cooked potato, carrot, and pear, but somewhat retarded on apple. Involution forms such as were reported by NovouspenskiĖ (see above) in case of the apple scab fungus were not observed in the cultures of *F. pirinum*.

[On the etiology of Stippigkeit], I. L. SERBINOV (*Zhur. Bol'znyi Rast.*, No. 2-3 (1914), p. 51; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, p. 75).—Large losses are said to be sustained every year by Russian apple growers through a physiological fruit spot called in Germany Stippigkeit. Certain experiments conducted by the author have led him to think that this disease is due to intensive culture.

[White and brown fruit spot of pear], I. L. SERBINOV (*Zhur. Bol'znyi Rast.*, No. 4-5 (1914), p. 123; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 61).—Two leaf spot fungi commonly appearing on pear leaves, *Septoria piricola* and *Entomosporium maculatum*, have been reported by the author as attacking the fruit also.

**Experiments on American gooseberry mildew in Cambridgeshire**, F. T. BROOKS, F. R. PETHERBRIDGE and G. T. SPINKS (*Jour. Bd. Agr. [London]*, 22 (1915), No. 3, pp. 227-230).—The purpose of these experiments, which were made in 1913-14, was to see if some form of spraying or soil treatment carried out on a commercial basis could replace the present system of pruning. In 1914 the summer stage of the fungus was particularly prevalent and wide-spread, so that the experiments were carried out under severe conditions. The treatment was probably more carefully done than would often be the case in commercial enterprises.

Spraying twice in the early part of the spring with lime sulphur or Bordeaux mixture, while somewhat helpful, was not profitable. Soil treatment and winter spraying also proved to be ineffective. Heavy use of farmyard manure favored the disease by causing abundant succulent growth. Pruning is deemed the only practical means of checking the disease. This is best carried out in

autumn, as soon as danger of renewed growth is past, usually early in September. Since perithecia form on the berries as early as May, it is important to destroy all diseased fruit as soon as possible.

**Studies in the physiology of parasitism.—I, The action of *Botrytis cinerea*, W. BROWN** (*Ann. Bot. [London]*, 29 (1915), No. 115, pp. 313-348).—This contribution, the first of a series of studies now being carried out, is intended to lead the way to a fuller understanding of the more highly specialized parasites.

A method of preparing quickly and in practicable quantities a very powerful extract from the germ tubes of *B. cinerea* is described in some detail, as possibly applicable to other studies along similar lines.

It is stated that the extract shows two types of action on a plant cell, one on the cell wall leading to disintegration of the tissue, another on the protoplast producing death at a late stage of the former process. The extract may be deactivated by heating, mechanical agitation, or neutralization with alkali.

It is thought that neither oxalic acid nor oxalates have any share in producing the toxicity of the extract, and that any lethal substance present must be of a colloidal nature. The only active substance in the extract appears to be the enzyme, which produces a macerating effect mainly by solution of the middle lamella, and which causes also the lethal action of the extract. The death of the cells is brought about presumably by its action, either directly on the protoplasmic membrane or indirectly as a result of its action on the cell walls. The ability of certain tissues to resist the action of the extract is dependent upon the special properties of their cell walls.

**Peroicid as a substitute for copper sulphate in combating *Peronospora* of grape stocks, F. GVOZDENOVIC** (*Ztschr. Landw. Versuchsw. Osterr.*, 18 (1915), No. 1-2, pp. 11-28).—This is an account and discussion of tests made with Peroicid, a proprietary preparation to be used in the form of spray, paste, or powder for the control of *Peronospora*, and a comparison of the fungicidal values of such preparations with those of sprays in common use.

**The hibernation of the powdery mildew of the vine (*Uncinula necator*) in Hungary, J. IBOS** (*Borászati Lapok*, 46 (1914), Nos. 59, pp. 703, 704; 51, pp. 712, 713; 52, pp. 728, 729, figs. 8; abs. in *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, p. 312).—The question as to how powdery mildew of grape passes the winter is said to be still unanswered. Istvánfi, in 1908, is said to have been the first to find the perithecia in Hungary.

The author observed considerable injury to grapes in the autumn of 1913. A large number of leaves examined in November showed perithecia on the mildew patches. The very abundant formation of these patches was thought to be due to the great variations in climatic conditions in that year, the summer being cool and wet and the autumn dry and warm.

**A banana disease in Cuba, J. R. JOHNSTON** (*Estac. Expt. Agron. Cuba Circ.* 47 (1915), pp. 1-9, pls. 7).—An account is given of the appearance, progress, and effects of a disease of banana in Cuba, which is stated to cause heavy losses in some districts and to threaten banana culture in this region.

The discoloration, wilting, and rotting of the parts is described, also the appearance of the stems in cross section, showing the relation thereto of the fungus, which is found in connection with the vascular bundles. The varieties which appear to be susceptible or resistant are indicated. The use of 0.2 per cent corrosive sublimate or other disinfectant is recommended, also removal of affected plants by cutting close to the ground and the application of quicklime to the stump.

***Marasmius perniciosus* n. sp., the cause of the krulloten disease of cacao in Surinam, G. STAHEL** (*Dept. Landb. Suriname Bul.* 33 (1915), pp. 27+25+26,

pls. 12; *abs. in Agr. News [Barbados]*, 14 (1915), No. 354, p. 382).—This contribution, which is given in Dutch, English (translation by A. M. W. Ter Laag), and German, is said to be the outcome of an investigation suggested by the publication of studies by Rorer (E. S. R., 29, p. 851) on the witches' broom disease of cacao in Surinam.

The organism, which is found in diseased shoots, indurated pods, and infected flower cushions of the cacao tree, is described as *M. perniciosus* n. sp. Mycelium isolated from diseased plants and used for inoculation gave no results, but spore material reproduced the disease.

While heavy shade appears to favor the fungus by the retention of moisture, it is thought best to decrease the shade gradually rather than suddenly. Drainage has the effect of strengthening the plants against attack. The diseased parts should be destroyed, and Bordeaux mixture should be applied to the trees in the form of a fine spray.

Coffee leaf disease (*Hemileia vastatrix*) in Uganda, S. SIMPSON and W. SMALL (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), pp. 365, 366).—In an abstract here given of this paper, it is said to have been established that no record exists of coffee trees having been attacked locally by any species of *Hemileia* other than *H. vastatrix*, and that so far spores of this fungus from *Coffea robusta* have failed to infect leaves of cultivated coffee.

The drier weather of 1913 arrested the disease. Bordeaux and Burgundy mixtures have continued to give good results, but other applications have been disappointing.

No aecidial stage of *H. vastatrix* has yet been found. At least 10 genera of the Rubiaceae occur in the Victoria Nyanza region, and 4 of these are known to harbor species of *Hemileia* in other localities.

Citrus canker, A. J. COOK (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 12, pp. 520, 521).—This is partly a brief notice of information, furnished mainly by Berger (E. S. R., 34, p. 649) and by Stevens (E. S. R., 31, p. 54), regarding the origin, distribution, symptoms, and results of citrus canker, and partly a discussion of protective measures, including quarantines by States.

Citrus canker in America. The outbreak of a new disease, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 6, pp. 517, 518).—The author discusses an extract from a bulletin on citrus canker by Stevens (E. S. R., 31, p. 54) and one from the above article by Cook.

The discovery of the chestnut blight parasite (*Endothia parasitica*) and other chestnut fungi in Japan, C. L. SHEAR and N. E. STEVENS (*Science*, n. ser., 43 (1916), No. 1101, pp. 173-176).—The presence of *E. parasitica* on chestnut trees in the vicinity of Nikko, Japan, was definitely established from material received from several sources. In addition to *E. parasitica*, *E. radicalis* has been found on the bark of *Pasania* sp., a genus closely related to *Quercus*. This seems to establish the fact that *E. radicalis* is indigenous to Japan and is not confined to the genus *Castanea*.

The chestnut bark disease in Vermont, R. M. ROSS (*Vt. Forestry Pub.* 16 (1915), pp. 16, pls. 4).—It is stated that the chestnut blight, ascribed to *Endothia gyrosa parasitica*, and said to be found in all the New England States, threatens to infect all the chestnut areas in Vermont. No methods have been found effective in checking the disease or in saving a tree when once badly diseased.

While wood once infected begins to deteriorate within two years after the death of the tree, timber cut before infection may be seasoned and kept for many years. Suggestions for the utilization of chestnut wood are given. Complete destruction of all infected material is insisted upon.

**Diseases of Hevea in Ceylon**, T. PETCH (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), p. 172).—In the abstract here given of this paper, it is stated that the diseases acquired by *H. brasiliensis* during its cultivation in the East for over 30 years have been comparatively few and mild.

The most important diseases of this tree in Ceylon at the present time are brown root disease (*Hymenochete noxia*), pink disease (*Corticium salmonicolor*), dieback (*Botryodiplodia theobromae*), and canker (*Phytophthora faberi*). The production of nodules and the decay of the tapped cortex are more serious phenomena which have not yet been traced to the agency of fungi.

[A larch leaf disease], A. A. LEBEDEV (Zhur. Bol'ezni Rast., No. 4-5 (1914), p. 136; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, p. 61).—A serious larch leaf disease, attributed to *Hartigella laricina* and resulting in a complete defoliation and death of nursery stock, has been described by the author as occurring in the Province of Voronezh, Russia. Spraying with Lazurin (a prepared Bordeaux mixture) and removing affected leaves gave very good results.

**Peridermium harknessii and Cronartium quercuum**, E. P. MEINECKE (*Science*, n. ser., 43 (1916), No. 1098, p. 73).—The author reports the successful inoculation of *Pinus radiata* with ascospores of *P. harknessii* and the fact that the mycelium of *C. quercuum* winters over in the old green leaves of *Quercus agrifolia*. The uredinal sori on the young leaves are said to be the results of infection from the sori on the old leaves. The author claims that if *P. harknessii* is connected with *C. quercuum*, this is a case of facultative heterecism in both generations.

**Brown oak and its origin**, P. GROOM (*Ann. Bot.* [London], 29 (1915), No. 115, pp. 393-408).—An account is given of a study made on reddish or brown heartwood of individual trees of the species *Quercus robur* in Great Britain.

The change, which is little if at all injurious to the wood for a long time, is apparently due to a fungus, the conidiophores of which closely resemble those of *Penicillium*. On incipient brown oak of some specimens were produced small spheroidal basidiocarps which were identified by Massee as *Melanogaster variegatus broomianus*, but the identity of the conidiolate fungus with the basidiolate one was not established by pure cultures.

Results are also given of a study of the tannin in oak heartwood by W. P. Rial.

#### ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Birds of Porto Rico**, A. WETMORE (*U. S. Dept. Agr. Bul.* 326 (1916), pp. 140, pls. 10).—This work is based upon investigations commenced in December, 1911, from which time continuous field work was carried on until September, 1912. All the principal regions of the island were visited, short trips having been made to the adjacent islands of Vieques and Culebra, and four days spent on Descheo Island, in Mona Passage. As a result of this work more than 2,200 stomachs of birds collected at all seasons were available for laboratory study and investigation, about 2,000 of which were collected by the author. It is pointed out that the examination and results have additional importance as representing the first extended work of the kind carried on within the tropical regions of the Western Hemisphere.

In the introduction the author first presents the itinerary, following which he deals with the physiography of Porto Rico; bird life in cane fields, coffee plantations, and citrus groves; economic considerations; bird enemies of the mole cricket, sugar cane root borer, weevil stalk borer, and May beetle; methods of increasing birds; introduction of birds, etc.

The greater part of the work (pp. 17-129) is taken up by an annotated list of 178 species known to inhabit or visit Porto Rico. The data include the names by which the species is known, a brief account of its habits, and a statement regarding its food and economic status. In some cases detailed lists of insects and other animals, seeds, and fruits identified in the stomachs are given in systematic order, so that as the status of other forms of life becomes known the relation of the birds to them may be more easily ascertained. A bibliography of the literature relating to the ornithology of Porto Rico and a subject index are appended.

A peculiarity in the growth of the tail feathers of the giant hornbill (*Rhinoplax vigil*), A. WETMORE (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 497-506).

Strychnin sulphate.—Its effect on California valley quail, C. C. PIERCE and M. T. CLEGG (*Pub. Health Rpts. [U. S.]*, 30 (1915), No. 50 pp. 3601-3604).—The authors report experiments conducted which have been summarized as follows:

"In each case convulsions and death occurred within a period of two hours after administering the barley, and in each case the barley was reclaimed from the pouch of the squirrel after death, showing, what had already been proved, that strychnin is rapidly absorbed through the membranes of this organ.

"California valley quail may be fed, under natural conditions, relatively large amounts of strychnin sulphate without showing toxic symptoms. The minimum lethal dose by subcutaneous injection is 4 mg. per 100 gm. of body weight. The California ground squirrel (*Citellus beecheyi*) is very susceptible to strychnin sulphate; 0.09 mg. per 100 gm. of body weight produced convulsions. Nineteen grains of barley, containing 2.7 mg. of strychnin sulphate, when retained in the pouch of the ground squirrel, proved fatal. Poisoned barley, as used for ground squirrel eradication, does not cause the death of California valley quail under natural feeding conditions."

Five new mammals from Mexico and Arizona, E. A. GOLDMAN (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 133-137).

Descriptions of a new genus and seven new races of flying squirrels, A. H. HOWELL (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 109-113).

Five new rice rats of the genus *Oryzomys* from Middle America, E. A. GOLDMAN (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 127-130).

The distribution and combat of the field mouse in Bavaria from 1902 to 1913, L. HILTNER (*Landw. Jahrb. Bayern*, 4 (1914), No. 5, pp. 437-478, figs. 24).—A description of the dissemination of this pest and of control work in Bavaria.

A systematic account of the grasshopper mice, N. HOLLISTER (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 427-489, pl. 1, figs. 3).

Medical and veterinary entomology, W. B. HERMS (*New York: The Macmillan Co.*, 1915, pp. XII+393, figs. 228).—In this work the subject is dealt with under the following headings: Parasites and parasitism; insect anatomy and classification; insect mouth parts; how insects carry and cause disease; cockroaches, beetles, and thrips; the lice; bedbugs and cone noses; mosquitoes; mosquitoes as disease bearers; mosquito control; buffalo gnats and horse flies; the common house fly; house fly control; bloodsucking muscids—tsetse flies, stable flies, horn flies; myiasis; fleas and louse flies; ticks; mites; and venomous insects and arachnids—bees, wasps, spiders, scorpions, etc. A general classification of bacteria and protozoa is appended.

[Papers on insects and insect control] (*Ann. Serv. Épiphyties, Mem. et Rap.* 1 (1912), pp. VIII+462, pls. 3, figs. 80).—The papers here presented of interest to economic entomologists include the following: *Icerya purchasi* in France

and the Acclimation of *Novius cardinalis*, by P. Marchal (pp. 13-26); The Acclimation of *N. cardinalis* in Gardens of the Peninsula of Cape Ferrato Invaded by *I. purchasi*, by G. Poirault and A. Vuillet (pp. 27-33); Protection of Cultivated Plants from Insects of Exotic Origin, by A. Vuillet (pp. 34-50); A Note on the Necessity of the Employment of Poisonous Substances, Particularly Arsenate of Lead, in Agriculture, by E. Roux (pp. 51-56); Opportunity for the Employment of Arsenicals, and Particularly Arsenate of Lead, in Agriculture, by P. Marchal (pp. 57-62); Tests of the Toxicity of Some Arsenical Compounds Employed in Agriculture, by H. Fabre (pp. 63-76); A Consideration of the Use of Arsenicals in the Southern Section, by F. Picard (pp. 77-79); The Potato Tuber Moth (*Phthorimæa operculella*), by F. Picard (pp. 106-176); Studies of a Disease of the Peach Tree in the Valley of the Rhone Caused by *Xyleborus dispar*, by J. Beauverie (pp. 186-195); The Fight Against *Diaspis pentagona* in Italy, by G. Gastine (pp. 196-219); The Asparagus Fly (*Platyparca pæciloptera*) in the Environs of Paris, by P. Lesne (pp. 228-247); The Cochylis and Eudemis Moths in 1912, by P. Marchal (pp. 248-252); Studies of the Cochylis and Eudemis Moths in Bordenaux in 1912, by J. Feytaud (pp. 253-330); The Cochylis and Eudemis Moths in the Valley of the Loire, by Vezin and L. Gaumont (pp. 331-338); Observations on the Cochylis and Eudemis Moths in Burgundy in 1912, by A. Paillot (pp. 339-351); Report on the Cochylis and Eudemis Moths in Southern France, by F. Picard (pp. 352-361); Tests of Illuminated Traps in Champagne in 1911-12, by J. Chatanay (pp. 365-371); Studies of the Vegetable Parasites of Cochylis and Eudemis Moths, by G. Fron (pp. 372-378); Studies of the Pathogenic Action of Divers Coccobacilli of the May Beetle, Silkworm, and Cochylis and Eudemis Moths, by E. Chatton (pp. 379-391); and A Note on the Coccidæ of West Africa, by P. Varzière (pp. 426-432).

Work of the colonial entomologist, R. MAYNÉ (*Bul. Agr. Congo Belge*, 5 (1914), No. 4, pp. 577-600, figs. 8).—The author here deals with the enemies of rubber in Belgian Kongo, and presents a note on an enemy of coffee (*Stephanoderes coffea*) and a brief account of the citrus butterfly (*Papilio demoleus*).

[Report of the entomologist of Southern Nigeria]. W. A. LAMBORN (*Ann. Rpt. Agr. Dept. South. Nigeria*, 1913, pp. 21-39).—In this report for the period from May 26 to December 31, 1913, the author discusses the insect enemies of cotton, cacao, maize, guinea corn, peanuts, etc. Three species of ticks, namely, *Boophilus annulatus decoloratus*, *Rhipicephalus simus*, and *Amblyomma variegatum*, are said to abound in the district.

Insect pests of wheat, W. B. GURNEY (*Dept. Agr. N. S. Wales, Farmers' Bul.* 192 (1915), pp. 32-40, figs. 8).—A brief account of the more important insect enemies of wheat in New South Wales.

Some of the more important truck crop pests in Georgia, W. V. REED (*Ga. Bd. Ent. Bul.* 41 (1915), pp. 39, figs. 29).—A brief popular account is given of the more important insect enemies of truck crops and means for their control.

Carbon bisulphid and its use for grain fumigation, W. H. GOODWIN (*Mo. Bul. Ohio Sta.*, 1 (1916), No. 3, pp. 86-90, figs. 3).—Directions are given for the practical use of carbon bisulphid as an insecticide.

[Cranberry insects in Wisconsin], O. G. MALBE (*Wis. State Cranberry Growers' Assoc. [Proc.]*, 28 (1915), pp. 15-17).—This is a report of the occurrence of, and work of the season of 1914 with, the cranberry fruit worm, cranberry leaf miner, and cranberry tip worm.

Blueberry insects in Maine, W. C. WOONS (*Maine Sta. Bul.* 244 (1915), pp. 240-268, pls. 4, figs. 3).—In his introduction the author first considers the status of the blueberry industry in Maine, which is restricted in large part to the

blueberry barrens of Washington County, comprising some 250,000 acres. It is stated that in 1912 90,000 bu. of blueberries were canned and the industry valued at \$2,000,000. Three species of blueberries occur on the barrens, namely, *Vaccinium pennsylvanicum*, *V. canadense*, and *V. vacillans*, but the first two of these predominate decidedly. Since *V. canadense* ripens about 10 days later than *V. pennsylvanicum* the berry season is fairly long.

Accounts are given of eight insects of economic importance, all but one of which attack the fruit. The present account of the apple maggot is more at length than that previously noted (E. S. R., 32, p. 350). The maggot is the most important enemy of the blueberry in Washington County, to which locality the pest is largely restricted so far as this crop is concerned. A hymenopterous parasite, *Blasteria rhagoletis*, previously noted (E. S. R., 34, p. 456), was reared in considerable numbers from puparia obtained from blueberries in 1913, which apparently reduced the number of maggots considerably during the summer of 1914. With the large crop in 1913 only from 1 to 2 per cent was attacked, but the yield in 1914 was so small that from 8 to 10 per cent of the fruit was maggoty and conditions were much the same in 1915. It is stated that no measures aimed at complete control of the pest have proved really practical but that with an ordinary yield no elaborate system of control is needed. Burning the plains, as is commonly done, is a practice to be highly recommended since it not only restores the fertility of the land but destroys the puparia which lie near the surface of the soil.

A new cecidomyiid, i. e., Itonidid, though found in the fruit in considerable numbers, is not of economic importance since it infests only decaying or decayed berries. Descriptions of this species and its several stages under the name *Lasioplera fructuaria* by E. P. Felt are incorporated in the account.

The pomace fly is said to have been reared in great numbers from blueberries placed in cages in the insectary as soon as the fruit had become a trifle old and had lost its firmness. It is pointed out that unless stored berries are packed securely and guarded against the attack of this fly, it may prove to be a very serious pest.

The currant fruit weevil (*Pseudanthrenus validus*) is quite widely distributed in Maine as a blueberry pest, occurring at both Orono and Cherryfield, the only places at which extensive collections of berries have been made for the study of their insect enemies. So far as known it is confined to the low blueberries (*V. pennsylvanicum* and *V. canadense*). Hibernation takes place in the adult stage. Oviposition commences about the middle of June while the berries are still small and green, the egg usually being placed in one of the calyx lobes. On hatching out, the larva tunnels to the center of the berry, leaving behind it a hardened reddish trail, which is very conspicuous in the green pulp. A single berry is said to furnish sufficient nourishment for one weevil, all parts of the fruit being eaten except the outer coat of the seeds, and the berry is left just a shell around a mass of fine brown frass. There is but one generation a year in Maine. A description of its several stages by W. D. Pierce is included.

A fruit caterpillar, thought to be *Epinotia fasciolana*, is, next to the maggot, the insect most commonly found in the fruit. This pest, while very abundant in 1913, was so extensively parasitized that it was quite rare the following year and had not appreciably reestablished itself in 1915. It appears to be generally distributed throughout the State. The eggs are deposited singly on the outside of the berry while it is still green, usually somewhere around the calyx lobe. Upon hatching out in most cases the larva enters the berry near the calyx end, usually on the outside of the berry at the base of one of the sepals, but some enter by the calyx cup and a few near the stem end. If

one berry does not contain enough food the larva may make its way to one which has been webbed to it. In 1913 its numbers were greatly reduced by an ichneumonid parasite of the genus *Pimpla*.

The blueberry damsel bug (*Nabis rufusculus*), which probably occurs throughout the State, deposits its eggs in the fruit and the nymphs, which are predaceous, live upon the plant, but this seems to be the only way in which the blueberry is directly concerned in their life cycle. Occasionally a little scale of the genus *Pseudococcus* is found in the calyx end of the berry.

In addition to the insects which attack the fruit, to which particular attention was paid by the author, a leaf beetle, namely, *Galerucella decora*, was observed to be decidedly injurious to the foliage of the blueberry in Maine. It is said to be widely distributed through the State and in the vicinity of Orono to have been very abundant during the past three seasons and to have killed a considerable number of blueberry bushes. It hibernates in the adult stage, and the eggs are deposited about the middle of June. The larvæ eat the leaves very rapidly and in great amount, the leaves being skeletonized and only the brown ribs and upper epidermis left. Bushes which are defoliated two or three years in succession usually are killed.

**Insects affecting the coconut palm in Trinidad, F. W. URICH** (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 6, pp. 200-203).—An annotated list of the more important insects of the coconut palm in Trinidad.

**Insects as carriers of the chestnut blight fungus, R. A. STUDEHALTER and A. G. RUGGLES** (*Penn. Dept. Forestry Bul.* 12 (1915), pp. 33, pls. 4).—Following a brief review of the literature relating to the transmission of plant diseases by insects, the authors report the results of investigations conducted, including those obtained from cultures, the microscopic examination of centrifuged sediments, etc. The work has been summarized as follows:

"Each insect tested was placed in a flask containing 100 cc. of sterile water, kept there for at least several hours, small quantities of the water plated out in dilution plates, and the wash water centrifuged in case positive results were obtained. Tests were made of 21 ants used in certain laboratory and insectary experiments in which they had been permitted to run over chestnut bark bearing spore horns or active perithecial pustules of the chestnut blight fungus (*Endothia parasitica*). Five of these 21 ants were found to be carrying spores of the chestnut blight fungus.

"Tests were also made of 52 insects and 2 spiders brought in from the field. All but 3 of these were picked directly from the chestnut blight cankers. Both of the spiders yielded negative results, while 19 of the 52 insects from the field were found to be carrying spores of *E. parasitica*. Positive results were obtained from insects in the orders Hemiptera, Coleoptera, Diptera, and Hymenoptera. The only other order of insects represented was the Lepidoptera, of which only 2 individuals were tested, both with negative results.

"The number of viable spores of the blight fungus carried varied from 74 to 336,960 per insect. The cultures from 8 insects contained no fungus colonies except those of *E. parasitica*. Each of the 8 individuals tested of *Leptostylus macula*, one of the beetles which feeds on pustules of the blight fungus, yielded positive results. The 3 highest positive results obtained, 336,960, 145,340, and 8,538, were from *L. macula*. It was demonstrated that the spores of the blight fungus were easily shaken from the body of this beetle by its own movements.

"From the rate of development of the colonies of *E. parasitica* in cultures, it was determined that the insects from the fields were carrying pycnospores almost exclusively. A microscopic examination of the centrifuged sediments showed a very few ascospores, and these from only 5 insects. Pycnospores were present in the sediment from every insect yielding positive results. The

Insects tested, even *L. macula*, which eats the pustules, were therefore carrying pycnospores almost exclusively. Most of the pycnospores were probably brushed off from normal or diseased bark, or both, by the movements of the insects over these surfaces. Some were probably obtained while eating the pustules, and some may have been obtained from the soil around the bases of diseased trees.

"Most of the insects were also carrying spores of fungi other than *E. parasitica*. The number of species of other fungi varied from 0 to 7 in the cultures, but was shown by microscopic examination of the centrifuged sediments to be greater, in at least some cases. In proportion to size, insects may carry a greater number of spores of the blight fungus than birds.

"We are led to the conclusion that some insects carry a large number of spores of the blight fungus, and that they are important agents in the local dissemination of this disease. This is especially true of the beetle, *L. macula*."

A list of 55 titles of the literature cited is appended.

**Hydrocyanic acid gas against household insects**, L. O. HOWARD and C. H. POPEHOE (*U. S. Dept. Agr., Farmers' Bul. 699* (1916), pp. 8).—This is a revision of Bureau of Entomology Circular 163, previously noted (*E. S. R.*, 28, p. 352).

**Orthoptera of the Yale-Dominican expedition of 1913**, A. N. CAUDELL (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 491-495).

**The genera of the tettiginiid insects of the subfamily Rhaphidophorinae found in America north of Mexico**, A. N. CAUDELL (*Proc. U. S. Nat. Mus.*, 49 (1916), pp. 655-690, figs. 28).

**[Migratory locusts in South America]** (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 6, pp. 191-199, pls. 5).—Several papers are here presented relating to the subject, including A Report on Locusts in Venezuela, by W. G. Freeman (pp. 191-194); Notes on the South American Migratory Locust (*Schistocerca paranensis*), by F. W. Ulrich (pp. 194-197); Report on the Inoculation of Locusts with *Coccobacillus acridiorum*, by J. B. Rorer (pp. 197, 198); and The Manual Value of Locusts, by A. E. Collens (p. 199).

Inoculation experiments with *C. acridiorum* show that its virulence can be increased for the Venezuelan locust (*S. paranensis*) in a way similar to that used in Yucatan and Argentina. An experiment with the giant locust (*Tropidacris dux*) shows that the organism is virulent for it also.

**Jerusalem's locust plague**, J. D. WHITING (*Nat. Geogr. Mag.*, 28 (1915), No. 6, pp. 511-550, figs. 25).—The author reviews the history of former locust invasions and describes and illustrates the great devastation caused by locusts in Jerusalem and the means that have been taken to combat them.

**Observations on Chermes spp. in Switzerland**, N. A. CHOLODKOVSKY (*Russ. Ent. Obozr.*, 14 (1914), No. 2-3, pp. LXXIX-LXXXIII; *abs. in Rev. Appl. Ent.*, 3 (1915), Ser. A, No. 7, pp. 343, 344).—This reports observations on the biology of *Chermes* spp.

**Identity of Eriosoma pyri**, A. C. BAKER (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 23, pp. 1115-1119, fig. 1).—As stated by the author, this paper was written in order to reinstate the woolly aphid described by Fitch from apple (*Malus* spp.) roots, to point out its distinctness from the woolly apple aphid (*E. lanigerum*), with which it has been confused, and to place it among the species of the genus to which it properly belongs, namely, *Prociphilus*. In his studies the author has had Fitch's original notes on the species and his type of *Prociphilus pyri* at hand. Descriptive notes and figures of the species of *Prociphilus* are given as an aid in the placing of *P. pyri*.

**Destruction of body lice, agents in the transmission of recurrent fever and exanthematous typhus, by oil of eucalyptus**, E. SERGEANT and H. FOLEY (*Bul. Soc. Path. Exot.*, 8 (1915), No. 6, pp. 378-381; *abs. in Amer. Jour. Trop. Diseases*

and Prev. Med., 3 (1915), No. 2, pp. 109-111).—The authors find that the oil of eucalyptus is an efficient disinfection agent for use against body lice in loco, on the clothing, and on the body while still clothed.

Descriptions of new species and genera of Lepidoptera from Mexico, H. G. DYAR (Proc. U. S. Nat. Mus., 47 (1915), pp. 365-409).

Lepidoptera of the Yale-Dominican expedition of 1913, H. G. DYAR (Proc. U. S. Nat. Mus., 47 (1915), pp. 423-426).

Report on the Lepidoptera of the Smithsonian biological survey of the Panama Canal Zone, H. G. DYAR (Proc. U. S. Nat. Mus., 47 (1915), pp. 139-350).

New genera and species of Microlepidoptera from Panama, A. BUSCK (Proc. U. S. Nat. Mus., 47 (1915), pp. 1-67).

Contributions toward the knowledge of the injurious Microlepidoptera of the fir and spruce, I. TRÄGÅRDH (Skogsvårdsför. Tidskr., No. 11 (1915), pp. 313-374, figs. 49; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 6, pp. 290-292).—The species here considered are *Dioryctria schützella*, *Pandemis ribeana*, *Grapholitha (Epiblema) tedella*, *G. (Epinotia) nanana*, *Argyresthia tiluimutella*, *Cacacia piceana*, *Evetria resinella*, *Heringia dotecella*, *Cedestis gyscelinella*, *Dyscedestis farinatella*, and *Oenoseroma pinariella*. A bibliography of 28 titles is appended.

The noctuid moths of the genera *Palindia* and *Dyomyz*, H. G. DYAR (Proc. U. S. Nat. Mus., 47 (1915), pp. 95-116).

The pickle worm or cucumber worm (*Diaphania nitidalis*), H. GARMAN (Kentucky Sta. Dept. Ent. and Bot. Circ. 3 (1915), pp. 7, figs. 5).—This insect has been the source of considerable injury in Kentucky during the past three or four years, particularly to cantaloupes and cucumbers. The injury commences about the middle of July and is at its height during August and early September. Several broods which overlap develop during this period. Treatment consists in rotation, the gathering and destruction of badly infested fruit, and plowing and harrowing immediately after the removal of the crop. Spraying with arsenicals may at times be employed to advantage but should be practiced with care.

The practical employment of the cacao moth parasite, W. ROEPKE (Meded. Proefstat. Nidden-Java, No. 18 (1914), pp. 25-27; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 6, pp. 313, 314).—A description is given of the manner of rearing and liberating cacao moth parasites and of the destruction of hyperparasites.

Two new Canadian Diptera, J. M. ALDRICH (Canad. Ent., 48 (1916), No. 1, pp. 26-22).—*Ezorisca cesar* reared from *Archips argyrospila* at Simcoe, Ontario, and *Frontina spectabilis* collected at Wabamie, Ontario, are described as new to science.

New western and southwestern Muscoidae, C. H. T. TOWNSEND (Jour. N. Y. Ent. Soc. 23 (1915), No. 4, pp. 218-234).

Diagnoses of new genera of muscoid flies founded on old species, C. H. T. TOWNSEND (Proc. U. S. Nat. Mus., 49 (1916), pp. 617-633).

The house fly, F. W. FITZSIMONS (London and New York: Longmans, Green & Co., 1915 pp. VI+80, figs. 22).—A small book of a popular nature which emphasizes the importance of combating the house fly.

The sporogony of *Hæmoproteus columbæ*, HELEN ADIE (Indian Jour. Med. Research, 2 (1915), No. 3 pp. 671-680, pls. 3).—The author concludes that "pigeons at the places and the times indicated are very heavily infected with *Hæmoproteus*; no other blood parasites were found. *Lynchia* flies associated with these pigeons are also very heavily infected with the sexual stages of a parasite analogous to *Proteosoma* and the malarial parasite. Where flies are

rare, pigeon infection is also rare. Kasauli pigeons show no flies and are, as far as my experience goes, free from infection.

"The development of *Hæmoproteus* can be traced in the fly; the oökinete, zygote, oöcyst, and sporozoite stages have all been demonstrated. Sporozoites have been seen in vast numbers in the salivary glands and streaming down the salivary duct. Both sexes of *Lynchia* carry the infection. Laboratory bred flies placed on infected birds have shown in due course both zygotes and sporozoites of the same type as those of naturally infected flies. Kasauli pigeons for good reasons thought to be uninfected (but not laboratory hatched) have become infected by flies taken off heavily infected Ambala birds (flies afterwards dissected and found infected). The sporogony of *Hæmoproteus* in this *Lynchia* is similar to that of *Proteosoma* and the malaria parasite. It is another instance of the cycle of Ross."

Fighting the fly peril, C. F. PLOWMAN and W. F. DEARDEN (London: T. Fisher Unwin, Ltd., 1915, pp. 127, pls. 7, figs. 4).—A popular and practical handbook.

Report on a mosquito survey at the mouth of the Connecticut River, P. L. BUTTRICK (Connecticut State Sta. Bul. 189 (1915), pp. 5-32, pl. 1).—This is a detailed report of a survey made with a view to ascertaining the location and character of mosquito breeding places, to determine how they can best be eliminated, and to estimate roughly the probable cost. It is thought that this survey with the accompanying map makes it possible for those interested to decide what work is most necessary, where money can best be spent, and the approximate cost.

*Anopheles* as a winter carrier of plasmodium.—The mosquito as a prophylactic indicator, M. B. MITZMAIN (Pub. Health Rpts. [U. S.], 30 (1915), No. 23, pp. 2117-2121).—The author reports upon investigations conducted at Scott, Miss., from February 3 to June 1, 1915.

During the three months from February 9 to May 9, 1,000 *Anopheles* mosquitoes collected were dissected and examined but no forms suggestive of the malarial plasmodium were encountered. Two mosquitoes (*Anopheles quadrimaculatus*) were found infected on May 15 and a third on May 26. The findings indicate that "at any time previous to May 15, in the locality investigated, protection from malaria may be secured by treating with quinia all the human carriers so that the insect carriers may not be permitted to carry out their rôle in completing the cycle. Failing this, prophylactic measures among healthy and other susceptible persons may be instituted any time, from May 15 to June 1, when it is considered the completion of the mosquito cycle in this locality makes preventive measures urgent."

The duck as a preventive against malaria and yellow fever, S. G. DIXON (Jour. Amer. Med. Assoc., 63 (1914), No. 14, p. 1203).—Attention is called to the habit of ducks of feeding upon mosquito larvae.

*Anastrepha serpentina*, a new pest of fruits in Brazil, J. S. TAYARES (Brotéria, Ser. Zool., 13 (1915), No. 1, pp. 52-54; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 7, p. 387).—In addition to the fruit flies *A. fraterculus*, *Ceratitis capitata*, and *Lonchæa ænea* which occur in Brazil, *A. serpentina*, which attacks the sapodilla (*Sapota achras*), has been discovered. About 30 days are required for its larval development and 15 for the pupal.

The biopathological relations of the Mediterranean fruit fly (*Ceratitis capitata*) and citrus fruits, L. SAVASTANO (Ann. R. Staz. Sper. Agrum. e Frutticol. Acireale, 2 (1914), pp. 97-123; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, pp. 604, 605).—The attack of the Mediterranean fruit fly is aggravated by an increase in the sugar content of citrus with the resulting decrease in acidity.

A bibliography of 47 titles is given.

Two new species of *Pipunculus*, F. KNAB (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 83-85, pl. 1).—*Pipunculus industrius* and *P. vagabundus*, both reared from the sugar beet leafhopper (*Eutettix tenella*) at King City and Pleasanton, Cal., are described as new to science.

Notes on some Virginian species of *Platypezia*, N. BANKS (*Jour. N. Y. Ent. Soc.*, 23 (1915), No. 4, pp. 213-216, pl. 1).

The life history and control measures for the cereal leaf beetle (*Lema melanopus*), G. KADOCSA (*Kisérlet. Közlem.*, 18 (1915), No. 1, pp. 109-178, pls. 8, figs. 3).—A detailed report of studies of this pest conducted at the Royal Entomological Station in Budapest.

The western 12-spotted cucumber beetle, E. O. ESSIG (*Univ. Cal. Jour. Agr.*, 3 (1915), No. 1, pp. 12-15, figs. 3).—This account relates to *Diabrotica soror*, a native of the Western States and especially abundant in California, where it is a source of considerable injury.

Problem of the bark beetle, J. M. SWAINE (*Canad. Forestry Jour.*, 11 (1915), No. 6, pp. 89-92, figs. 2).—This account is based upon work previously noted (E. S. R., 32, p. 551).

Species of *Rhynchites* and *Anthonomus pomorum* injuring orchards, J. F. SCHREINER (*Trudy Būro Ent. [Petrograd]*, 2 (1914), No. 14, 3. ent. ed., pp. 65, figs. 32; abs. in *Rev. Appl. Ent.*, 3 (1915), Ser. A, No. 9, pp. 533-535).—Seven species of *Rhynchites* injurious in Russia are considered.

Boll weevils hibernating in cotton seed (*Mississippi Sta. Bul.* 173 (1916), pp. 28, 29, fig. 1).—This records the discovery of three live weevils in 2 lbs. of seed cotton in January while ginning a sample by hand. The weevils are said to have been inside the seeds, having entered apparently after the seeds were nearly or quite mature, as the seed coats were about normal.

The Mexican bean weevil, E. O. AMUNDSEN (*Mo. Bul. Com. Hort. Cal.*, 5 (1916), No. 1, pp. 33, 34, figs. 3).—A Mexican bean, known as "guamuchile," is often found infested by *Bruchus limbatu*s. It is also found in the seeds of other legumes and if unchecked renders them unfit for food or seed.

New genera of chalcidoid Hymenoptera, A. A. GIRAULT (*Jour. N. Y. Ent. Soc.*, 23 (1915), No. 3, pp. 165-173).—Among the species here described of economic importance are *Holanusomyia pulchripennis* n. g. and n. sp., reared from the citrus mealy bug on bamboo at Manila, Philippine Islands; *Anagyrella corrina* n. g. and n. sp., reared from *Pseudococcus* sp., at Fresno, Cal.; *Metallo-noidea brittanica* n. subg. and n. sp., reared from the oyster shell scale, at Manchester, England; *Pseudhomalopoda prima* n. g. and n. sp., reared from *Chrysomphalus aonidum* and *Aleurocanthus acglami*, at Kingston, Jamaica; and *Paraleucocerus bicoloripes* n. g. and n. sp., reared from a cherry leaf miner (*Lithoceltis* sp.), at Woods Hole, Mass.

Vespid and sphecoid Hymenoptera collected in Guatemala by W. P. Cockerell, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 513-523).

West Indian wasps, H. A. BALLOU (*Agr. Notes [Barbados]*, 14 (1915), No. 34, p. 298, figs. 4).—A brief account of the more important wasps occurring in the West Indies.

Observations on the biology of Ixodidae, II, G. H. F. NUTTALL (*Parasitology* 7 (1915), No. 4, pp. 408-456).—In this second part of the work previously noted (E. S. R., 29, p. 58) the author reviews the literature relating to the biology of 14 species of ticks, in part, and reports original observations.

[Studies of *Cimex*], F. W. CRAGG (*Indian Jour. Med. Research*, 2 (1915), No. 3, pp. 698-720, pls. 3, figs. 2).—The author's work with *Cimex* is reported in two papers, the first relating to fertilization (pp. 698-705) and the second consisting of anatomical and physiological studies of the alimentary tract (pp. 706-720).

**On the life history and morphology of *Clonorchis sinensis*, H. KOBAYASHI** (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 75 (1915), No. 4, pp. 299-318, pls. 4).—This report of studies at the Imperial Institute for Infectious Diseases has been summarized as follows:

"Liver distomiasis in Japan is caused by *C. sinensis*. The natives in the district where the disease is prevalent are infested with the parasites through eating fresh-water cyprinoid fishes raw that are the intermediate hosts.

"Experimentally the following 12 species are ascertained to be the intermediate hosts of the distome: *Pseudorasbora parva*, *Leucogobio g  ntheri*, *L. mayed  *, *Sarcocheilichthys variegatus*, *Pseudoperilampus typus*, *Paracheilognathus rhombeum*, *Acheilognathus lanceolatus*, *A. limbatum*, *A. cyanostigma*, *Abbottina psegma*, *Biwia zezera*, and *Carassius auratus*.

"The encysted larva in the fish grows and reaches maturity in the cat, the dog, the rabbit, the guinea pig, and the rat. In the final host the cyst ruptures and the larva is set free. During the development in the final host, the spines of the 'cuticula' enlarge and then disappear. The size relations of the oral and ventral suckers are reversed. The final shape and position of the testes and the ovary are attained in 7 days and the egg formation begins in from 12 to 15 days.

"The parasite matures in from 23 to 26 days. Yellowish or brownish pigment of the adult is probably degenerated shell material contained in the yolk cells. Senile degeneration is found in larger specimens in which the vitellaria are partly [reduced] or wholly disappear, the pigment is present, and the uterus is empty. The liver distome in Japan constitutes a single species (*C. sinensis*)."

**An outline of the morphology and life history of *Crithidia leptocoridis* n. sp., IRENE McCULLOCH** (*Univ. Cal. Pubs., Zool.*, 16 (1915), No. 1, pp. 22, pls. 4, fig. 1).—The flagellate parasite *C. leptocoridis* occurs in immense numbers in the intestinal tract of the common box-elder bug (*Leptocoris trivittatus*).

**Studies in the life history of an ameba of the *Limax* group (*Vahlkampfa calkensi*), MARY J. HOGUE** (*Arch. Protistenk.*, 35 (1914), No. 2, pp. 154-163, pls. 3).—Most of the oysters found around New York are said to be infested with this ameba, while the Cape Cod oysters and those found near Woods Hole are peculiarly free from it.

**Identification of the stages in the asexual cycle of *Bartonella bacilliformis*, the pathogenic organism of verruga, and their bearing on the etiology and unity of the disease, C. H. T. TOWNSEND** (*Jour. Wash. Acad. Sci.*, 5 (1915), No. 21, pp. 662-667).—The author reviews studies relating to verruga which appear to indicate conclusively that the *Bartonella* is a protozoan, and attempts to interpret correctly the stages in the asexual cycle of *B. bacilliformis*. Accounts relating to verruga and its transmission by *Phlebotomus verrucarum* have previously been noted (E. S. R., 32, pp. 248, 350).

## FOODS—HUMAN NUTRITION.

**The velocity of the staling of bread, J. R. KATZ** (*K. Akad. Wetensch. Amsterdam, Versl. Wis. en Natuurk. Afdel.*, 23 (1914), pt. 1, pp. 652-655).—In continuation of previous work (E. S. R., 28, p. 861), the author reports experimental data indicating that the velocity of the staling of bread and its loss of imbibing power (which is thought to depend on a physical change in the starch of the flour so that it becomes harder and less capable of holding water) do not run quite parallel. It was found that the diminished capacity of the starch to absorb water took place the more rapidly, and that the vapor

pressure of both fresh and stale bread was approximately equal to that of pure water.

**The staling of bread,** J. R. KATZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis. en Natuurk. Afdel.*, 23 (1914), pt. 1, pp. 655-658).—From the results of a series of tests to determine the imbibing power and solubility of bread made of meals from several different kinds of grain the conclusion is given that the staling of bread is connected with a change which takes place not only with wheat and rye starch but also with all varieties of starch, but that it leads to practically important results only in the case of wheat and rye starch.

**The staling of bread from the physiological-chemical standpoint, I-III,** J. R. KATZ (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 104-129; 136-146, fig. 1; 147-151).—In the first of these papers, experimental data on the chemical and physical changes which take place when bread becomes stale are reported. These are in agreement with the work of Neumann (E. S. R., 32, p. 356). The author concludes that the principal cause of the staling of bread is a change in the starch, brought about by baking, by which the starch granules become harder and less capable of holding water and by which a part of the soluble polysaccharids become insoluble. At the same time there is a transference of the water in the starch to the gluten. Furthermore, the consistency of the gluten skeleton of bread influences the general texture of the bread.

In the second paper the author reports a further investigation of the changes produced in the starch granules of bread by baking and during staling. These data indicate that during baking the high temperature disturbs the equilibrium which ordinarily exists between starch, water, and gluten, and fresh bread results. During staling this equilibrium tends to be restored; at higher temperatures, accordingly, bread remains comparatively fresh.

In the third paper, from the data of experiments reported, he concludes that the starch granules of sago, rice, potatoes, barley, corn, oats, lentils, and marena undergo the same changes in the baking and staling of bread as occur in wheat and rye bread.

**Changes in the microscopical structure of bread during staling,** E. VERSCHAFFELT and E. VAN TEUTEM (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 130-135, pls. 2).—The authors describe studies of the microscopy of fresh and stale bread. The findings of these experiments are in agreement with Katz's theory of the staling of bread noted above.

**How to grow the peanut and 105 ways of preparing it for human consumption,** G. W. CARVER (*Alabama Tuskegee Sta. Bul.* 31 (1916), pp. 35).—In addition to information regarding the planting, cultivation, and food value of the peanut, 105 recipes are given for the use of peanuts in cookery.

**Recent observations in the use of soy bean in infant feeding,** J. F. SINCLAIR (*N. Y. State Jour. Med.*, 16 (1916), No. 2, pp. 83-88).—The results are reported of feeding soy-bean gruel to 74 infants under three years of age, who were suffering with gastrointestinal disturbances. Owing to its high protein and fat content the gruel proved very efficient in checking the weight losses which occur so frequently during these disorders.

In conclusion other uses of soy-bean flour are mentioned: "It has proved useful when mixed with cereals, oatmeal, or barley jelly. It may be used in broths. Where condensed milk must be employed it is of service because it supplies the protein and fat which is needed and which condensed milk lacks."

**Ice-cream making,** A. C. BAER (*Wisconsin Sta. Bul.* 262 (1916), pp. 36, figs. 4).—The material in this bulletin is based upon the results of about 600 freezing tests with plain ice creams made by the station under commercial conditions, and may be summarized briefly as follows:

The body (general firmness) and texture (smoothness) of ice cream are influenced by a number of factors, such as the age and kind of cream used, the amount of milk fat or other milk solids in the mixture, and the kind and amount of filler used. In order to secure good body and texture the cream should be aged from 24 to 48 hours at a low temperature before being frozen. If the cream is properly aged the product retains good body and texture for a much longer period than otherwise. Experiments with creams having percentages of milk fat varying from 8 to 30 per cent showed that ice cream made from cream having less than 18 per cent of fat was weak in body and poor in texture. The thinner the cream used the more filler was needed to accomplish the desired results.

The time of freezing and the speed of the freezer is important. A mixture frozen too rapidly was coarse in texture and weak in body, while if the speed of the dasher or disks was too low the cream was not whipped to the proper consistency and smoothness.

Since an excessive overrun results in a product of poor quality it should be avoided. A number of factors which influence overrun were studied, and these showed in general that by careful standardizing of the ice cream "mix" and by regulating the freezing operation it was possible to obtain a uniform overrun from day to day. A raw cream produced a higher overrun than a pasteurized cream. Aging a pasteurized or homogenized cream made a higher swell possible. Rapid freezing resulted in a lower overrun than when sufficient time was given to properly whip up the mixture. The kind and amount of filler did not seem to affect the overrun. A high swell resulted in an open-textured, light, foamy ice cream, and such a product was of poorer quality than one with less overrun. Because the amount of overrun affects the weight of ice cream, the nutrients in a given volume will also be affected; a high overrun ice cream contains less nutrients than a lower overrun product.

The flavor of ice cream is influenced by several factors, among them quality of flavoring materials, richness of cream, taints of cream, kind of cream, filler, and storage of the finished product. A pure extract of vanilla will produce a more pleasant flavor than cheap, imitation compounds. The natural fruit flavors are more desirable than the cheaper grade of extracts. An old, tainted, partly sour cream can not be made into a good ice cream. An excessive use of a low grade gelatin or ice-cream powder always can be detected in the flavor.

Considerable data are also given regarding the processes of freezing; the temperature during freezing; packing; and testing. A few simple formulas are given together with suggested score cards for judging ice cream. It is stated that creameries and milk plants can profitably make ice cream without much additional equipment, and if advantageously located they can install an equipment for manufacturing ice cream for about \$500.

**The manufacture of ice creams and ices, J. H. FRANDSEN and E. A. MARKHAM (New York: Orange Judd Co., 1915, pp. XIV+315, figs. 106).**—The chapters included in this book are the cream supply; the bacteriology of ice cream; the care of milk and cream at the factory; condensed milk, milk powder, and homogenized cream; stabilizers; flavoring; standardizing the ice cream mixture; preparing the ice cream mixture; classification of ice cream; ice cream formulas; water ices and sherbets; fancy molded ice creams; the freezing process; refrigeration; the economical operation of the refrigerating plant; scoring ice creams and ices; the ice cream factory, its location and equipment; factory management; by-products and side lines; and ice cream as a side line in the local creamery.

[Report of food and drug laboratory], H. E. BARNARD (*Ind. Bd. Health, Ann. Rpt. Chem. Div. Lab. Hyg.*, 9 (1915), pp. 1-153, figs. 39).—The work of the laboratory during the year ended September 30, 1914, is reviewed. This included the analysis of 1,703 samples of miscellaneous foods, of which 1,279 were found to be legal, and of 294 samples of drugs, of which 261 conformed to existing standards. Sanitary inspections were made of 12,106 places, including grocery stores, meat markets, drug stores, bakeries, hotels, and restaurants, of which 50 per cent were found to be in good condition.

Special reports are given of a sanitary survey of canneries and bottling works operating in the State. Reprints are included of A Study of Fruit Jar Caps, by Gail M. Stapp (E. S. R., 32, p. 856), and The Effect of Bread Wrapping on the Chemical Composition of the Loaf, by H. E. Barnard and H. E. Bishop (E. S. R., 32, p. 354). Reprints of various instructions and notices issued by the food commissioner conclude the report.

Electric cooking in a cafeteria, B. E. HANNON (*Jour. Electricity*, 36 (1916), No. 15, pp. 280, 281, figs. 2).—The electric cooking equipment of a cafeteria is described in detail, cost data being included.

School lunches, CAROLINE L. HUNT and MABEL WARD (*U. S. Dept. Agr., Farmers' Bul.* 712 (1916), pp. 27).—Although this publication was prepared primarily to furnish information regarding the foods best suited for the children's noon meal and for the school lunch basket, it emphasizes the fact that all three meals in a day's ration must be considered together and considerable space is devoted to the general food requirements of children. General information and suggested bills of fare are given for the home lunch, for the basket lunch, and for meals prepared at school. A few recipes for school-lunch dishes are included.

The child and its care, NEALE S. KNOWLES, LOUISE H. CAMPBELL, and MABEL C. BENTLEY (*Iowa State Col. Agr. Ext. Dept., Home Econ. Bul.* 2 (1915-16), pp. 32, figs. 14).—Considerable information is contained in this bulletin regarding the diet of infants and of children three years of age or more, suggestive lists of foods and menus being included. Hints are also given regarding the personal hygiene and clothing of children.

The physiology of the newborn infant. Character and amount of the catabolism, F. G. BENEDICT and F. B. TALBOT (*Carnegie Inst. Washington Pub.* 233 (1915), pp. 126, figs. 10).—In this publication the authors refer to earlier researches with newborn infants by other investigators and to the former paper by themselves (E. S. R., 32, p. 461). A translation is given of an article reporting respiration experiments with newborn infants, by K. A. Hasselbalch, who draws the conclusion that a well-nourished infant born at full term has a store of carbohydrates (glycogen) in its organs which is spent in the course of a few hours and that "the metabolism of a poorly nourished and premature infant depends chiefly on the oxidation of carbohydrates during the first hours of life." The conclusions of Hasselbalch are discussed by the authors in the light of other experiments.

The experiments here reported consist of observations of the metabolism of 105 newborn infants and include several hundred experimental periods. The technique employed is described in detail and the statistics of the observations are presented in tabular form.

An analysis of the data for the minimum metabolism periods shows that on the first day of life there are important temperature regulation disturbances which result either in a decreased metabolism, or an increased metabolism when there is an effort on the part of the infant to compensate for the loss of heat. After the second day there is a fair uniformity in the heat production

per square meter of body surface and a remarkable uniformity per square meter of body surface per unit of length. This constancy is such as to permit the establishment of a factor which indicates that when the square meter of body surface as computed from the body weight is divided by the length the metabolism per unit is 12.65 calories. From a study of the effect of temperature changes on the basal metabolism and the amount of available breast secretion in the first week of life, certain procedures for the conservation of energy and supplemental feeding are suggested.

**Acceleration of growth after retardation.** T. B. OSBORNE, L. B. MENDEL, EDNA L. FERRY, and A. J. WAKEMAN (*Amer. Jour. Physiol.*, 40 (1916), No. 1, pp. 16-20, pls. 2).—Curves are given illustrating the accelerated growth of a number of albino rats in which growth had previously been retarded either intentionally by the character of the diet or incidentally as the result of a failure on the part of the animals to eat enough of a supposedly adequate ration. The authors conclude that "after periods of suppression of growth, even without loss of body weight, growth may proceed at an exaggerated rate for a considerable period. This is regarded as something apart from the rapid gains of weight in the repair or recuperation of tissue actually lost. Despite failure to grow for some time the average normal size may thus be regained before the usual period of growth is ended."

**Studies in water drinking.**—XX, The relationship of water to certain life processes and more especially to nutrition, P. B. HAWK (*Biochem. Bul.*, 3 (1914), No. 11-12, pp. 420-434).—In this summary and digest of data, continuing previous work (*E. S. R.*, 34, p. 763) the author describes the physiological needs of the body for water from both the physical and the chemical standpoints. With regard to water drinking at mealtime, he concludes that for the normal individual "the drinking of a reasonable volume of water with meals will promote the secretion and activity of the digestive juices, the digestion and absorption of the ingested food, and will retard the growth of intestinal bacteria and lessen the extent of the putrefaction processes in the intestine."

**The relation of salivary to gastric digestion.** L. A. I. MAXWELL (*Biochem. Jour.*, 9 (1915), No. 3, pp. 323-329; *abs. Jour. Chem. Soc. [London]*, 108 (1915), No. 637, I, p. 1024).—From the experimental data here reported, the author concludes in part that unboiled starch does not hinder peptic digestion, but that all cooked farinaceous foods do this unless first subjected to salivary digestion.

**Gastrointestinal studies.**—XII, Direct evidence of duodenal regurgitation and its influence upon the chemistry and function of the normal human stomach, W. H. SPENCER, G. P. MEYER, M. E. REHFUSS, and P. B. HAWK (*Amer. Jour. Physiol.*, 39 (1916), No. 4, pp. 459-479, figs. 12).—The experiments here reported were undertaken to determine whether or not duodenal regurgitation does occur, as evidenced by the presence of some of the constituents of the duodenal secretions in the samples of material removed from the stomach. Of these constituents, trypsin was regarded as the most satisfactory indicator. Quantitative determinations of trypsin were made in samples of the stomach contents, obtained by fractional removal through the Rehfuß tube as has been described in earlier papers of this series. The samples were taken after the introduction into the stomach of hydrochloric acid; vinegar; water; sodium bicarbonate solutions of various strengths; and a small Ewald meal, both with water and with sodium bicarbonate solutions. From the results of these tests, which are reported in detail, the following conclusions are drawn:

"A tryptic enzyme is almost constantly present in the fasting and digesting contents of the normal human stomach. . . . [This] is deduced to be trypsin regurgitated from the duodenum.

"Trypsin in the gastric contents is highly resistant to the action of acid and pepsin. In general, tryptic value is high in the presence of low acidity and in alkaline reaction, and of low value when the gastric contents are of high acid concentration. A fall in the acidity is usually accompanied by a rise in the tryptic values.

"The color of the gastric contents often changes during the period of experiment from that of the ingested material to a golden yellow or a dark olive or blue green. This color change is due to regurgitation of bile from the duodenum and is absent on a diet of substances which do not cause the outpouring of bile. The tryptic values in the gastric contents usually rise concomitantly with the color change, although in a non-bile stimulating diet the tryptic value seems independent of the color.

"Sodium bicarbonate in 5 per cent solution is held in the stomach until sufficient hydrochloric acid is secreted to bring the alkalinity to a point where it is nonirritating to the duodenum. The retention is accompanied by a high trypsin value—suggesting antiperistalsis in the duodenum in response to an irritant. Sodium bicarbonate in 1 per cent solution hastens the emptying of the stomach either by increasing the motility of the stomach or opening the pylorus. Sodium bicarbonate solutions do not inhibit human gastric secretion, but seem to have a direct stimulatory effect in some cases.

"Free hydrochloric acid seems unnecessary for the opening of the pylorus, for the stomach sometimes empties while its contents are still alkaline. Fifteen per cent of hydrochloric acid ingestion is followed by a rapid fall in acidity to about 0.2 per cent, due to a regurgitation of alkaline duodenal contents, as is indicated by the rise in tryptic values coincident with the fall of acidity. The acid is then emptied from the stomach.

"Regurgitation of duodenal contents into the stomach is but another of the protective functions of which the body furnishes so many examples and has for its purpose the defense of the small intestines from irritants."

An extended bibliography is appended.

For earlier work in this series see a previous note (E. S. R., 34, p. 659).

**Green color in mother's milk after the ingestion of liver.** E. FREER (*Biochem. Ztschr.*, 72 (1916), No. 5-6, p. 378).—In the case of wet nurses it was observed that the milk secreted a few hours after the ingestion of beef or calves' liver had a green color, which was noticeable on comparing it with normal milk. The condition persisted for about 16 hours. The suggestion is offered that the color is due to the presence of some derivative of the coloring matter present in the liver eaten.

**Fasting studies.—XIV, The elimination of urinary indican during two fasts of over 100 days each.** C. P. SHERWIN and P. B. HAWK (*Biochem. Bul.*, 3 (1914), No. 11-12, pp. 416-419).—In connection with previous studies of this series (E. S. R., 30, p. 765) two fasting experiments with a dog are reported. The fasting periods were 117 and 105 days in length, differing only in the fact that the 105-day fast was a "repeated" one.

During the initial fast of 117 days the indican output was continuous and fairly high throughout, while during the repeated fast of 105 days the indican values were much lower. On the basis of these observations, the authors conclude that "the finding of diminished intestinal putrefaction as a result of 'repeated' fasting is in line with other observations . . . which have shown that 'repeated fasting' is accompanied by greater resistance, a less rapid loss in body weight, less pronounced protein catabolism, and a general physical and mental improvement."

## ANIMAL PRODUCTION.

**Experiments on the Mendelian laws of inheritance**, C. PUCCI (*Mod. Zoologia, Parte Sci.*, 25 (1915), No. 4, pp. 145-153, figs. 6).—Gray Flemish rabbits and white Polish rabbits were crossed. In  $F_1$  the gray color of the Flemish parent was dominant to the white of the Polish, but almost all the rabbits showed whitish spots. The  $F_2$  generation consisted of 52 pigmented and 16 white individuals, thus following the Mendelian ratios. It appears that the self-colored individuals of the  $F_2$  generation behave as heterozygotes and the white as homozygotes.

Rambouillet rams were crossed on Middle Tiber Valley ewes, which are noted for their very convex profile of nose and forehead, an open fleece, and the head, throat, belly, and limbs devoid of wool. In the  $F_1$  generation all the crosses had a straight face profile. In the  $F_2$  generation the convex profile appeared in ratio very nearly following Mendel's law. The extent of the fleece was greater in individuals with a straight profile, and seemed to follow, like the latter characteristic itself, the laws of dominance and of the numerical constancy of reversion.

**Variability under inbreeding and cross-breeding**, W. E. CASTLE (*Amer. Nat.*, 50 (1916), No. 591, pp. 178-183).—This paper comments on Walton's studies and conclusions (*E. S. R.*, 34, p. 370). The author points out the utility value of both inbreeding and cross-breeding in securing variations, and shows that each has its utility at the proper time and place.

[**Mice breeding experiments**], W. F. R. WELDON (*Biometrika*, 11 (1915), No. 1-2, App., pp. 60, pl. 1, figs. 7).—Complete data on mice breeding experiments are given.

**The determination of sex**, J. REGNAULT (*Compt. Rend. Assoc. Franç. Adv. Sci.*, 1914, pp. 554-557).—This is a short review of some of the principal theories on the determination of sex as applied to man, with special emphasis upon the influence of nutrition.

**Duration of the spermatozoa after fecundation, in the pullet and the duck**, A. CHAPPELLIER (*Compt. Rend. Assoc. Franç. Adv. Sci.*, 1914, pp. 519-526).—In his studies the author found that the extremes of duration of the spermatozoa after fecundation ranged from 10 to 18 days in the pullet and from 7 to 11 days in the duck. A bibliography of references on the subject is given.

**The effect of castration on the weight of the pituitary body and other glands of internal secretion in the rabbit**, A. E. LIVINGSTON (*Amer. Jour. Physiol.*, 40 (1916), No. 2, pp. 153-185, figs. 8).—The author concludes as the result of his studies with rabbits that "there is no constant sex difference in the weight of the hypophysis. Neither males nor females show a constant hypophyseal hypertrophy following castration or spaying. The females may be regarded as showing a more constant response by the hypophysis after spaying than is to be seen among the males after castration.

"From the curves of growth corresponding to each group there is a constant relationship between the rate of increase in body weight and the response of the hypophysis to castration or spaying. There is less hypertrophy of the hypophysis in those groups which show an increase in rate of growth. In groups where no effect can be shown upon the rate of growth a distinct hypertrophy of the hypophysis is constant, though in no case is it very marked.

"A marked atrophy of the uterus follows removal of the ovaries from females. No change in the weight of the heart or the kidneys can be attributed to castration or spaying. No change can be demonstrated in the thyroid with the possible exception of a moderate decrease in males after castration. The

suprarenals show no marked effect. In the males a tendency toward enlargement follows castration, which does not appear after spaying females. No conclusions were reached as to the effect of castration or spaying on the thymus or pineal gland."

A bibliography of references is given.

Studies on the carotin group of the animal body.—I, Insecta, P. SCHULZE (*Sitzber. Gesell. Naturf. Freunde Berlin*, No. 1 (1913), pp. 1-22, pls. 3, figs. 3.—This reports a study of the chemical and physical nature and the physiological significance of the carotinoids in insects.

Studies of the carotin-xanthophyll group.—II, The carotin structure of the Chrysomelidæ, P. SCHULZE (*Sitzber. Gesell. Naturf. Freunde Berlin*, No. 8-9 (1914), pp. 398-406, pls. 2).—This is a continuation of the above and treats of the physiological characteristics of the carotin-xanthophyll group as found in the Chrysomelidæ. A bibliography is given.

The palatability of farm grasses, C. G. WILLIAMS (*Mo. Bul. Ohio Sta.*, 1 (1916), No. 3, pp. 70-72).—In two experiments to determine the palatability of various farm grasses 4 horses were fed from 18 to 20 lbs. of hay a day, one-half of the hay of each feed being timothy, and the remainder an equal weight of one of the other hays, a different one being tried each succeeding day. The timothy was placed in one end of the manger and the hay to be compared with it in the other end.

It was found that, in general, the mixed clover and timothy hay was more palatable than timothy or any other one grass. Brome grass stood second and timothy third. While the rye grasses (Italian rye and perennial rye) received high rank in the first test, they did not hold up as well in the second, and it is probable that their proper position is intermediate. Tall oat grass was decidedly inferior as regards palatability, with blue grass and redbud close seconds.

Kafir corn ("dari") from South Africa (*Bul. Imp. Inst. [So. Kensington]*, 13 (1915), No. 3, pp. 379, 380; *abs. in Analyst*, 41 (1916), No. 478, p. 8).—Analyses are given of various types of South African Kafir corn.

Comparative experiments with feed roots, 1912-1914, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. III (1915), pp. 25, figs. 2; *K. Landth. Akad. Handl. och Tidskr.*, 54 (1915), No. 4, pp. 365-388, figs. 2).—Experiments were made with various feed roots during three years for the purpose of ascertaining their contents of dry matter. The roots under experimentation were 3 kinds of Bortfelder, 3 Yellow Tankards, and 2 Östersund turnips; 3 kinds of Bangholm and 2 kinds of Swedish turnips; and the Barres and Eckendorfer fodder beets.

It was found that the various kinds of the same roots are quite similar in the amount of dry matter gathered from 1 hectare, as when one kind yields a greater percentage of dry matter another gives a greater yield of crop. The oblong Bortfelder and the Yellow Tankard turnips were superior to the white Östersund, and among the beets, the Barres proved superior to the cylindrical Eckendorfer. In comparing the three kinds of roots, the Bortfelder, Yellow Tankard, and Östersund turnips proved inferior in dry-matter content to the beets and Swedish turnips. The Swedish turnips gave best results in central, the beets in southern Sweden. The former developed better during the wet and cold season of 1912, while the beets gave better results during the dry and warm summer of 1914.

Value of blood and other offal for feeding purposes (*Wiener Landw. Ztg.*, 65 (1915), No. 58, pp. 310, 311, figs. 2; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 7, pp. 970, 971).—An appa-

raturs for the utilization of blood and other slaughterhouse offal as food for live stock is described.

The breeds of live stock, C. W. GAY (*New York: The Macmillan Co., 1916, pp. XVIII+483, pls. 16, figs. 99*).—This book, which is one of the Rural Text-book Series, treats of the various breeds of horses, cattle, sheep, goats, and swine.

Steer feeding, J. C. BURNS (*Texas Sta. Bul. 182 (1915), pp. 3-16, pls. 6*).—Five lots of 12 2-year-old Hereford steers were fed for 140 days the following daily rations per head: For the first 90 days, lot 1, 4.72 lbs. of cotton-seed meal and 48.52 lbs. of corn silage; lot 2, 9.45 lbs. of cold pressed cotton seed and 41.46 lbs. of corn silage; lot 3, 4.72 lbs. of cotton-seed meal, 35.08 lbs. of corn silage, and 6.86 lbs. of rice bran; lot 4, 4.72 lbs. of cotton-seed meal, 35.08 lbs. of corn silage, and 9.1 lbs. of ground milo-maize heads; and lot 5, 4.72 lbs. of cotton-seed meal and 48.52 lbs. of corn silage; and during the last 50 days, lot 1, 6 lbs. of cotton-seed meal and 50 lbs. of sorghum silage; lot 2, 12 lbs. of cold pressed cotton seed and 36.16 lbs. of sorghum silage; lot 3, 6 lbs. of cotton-seed meal, 34.66 lbs. of sorghum silage, and 7.56 lbs. of rice bran; lot 4, 6 lbs. of cotton-seed meal, 32 lbs. of sorghum silage, and 12 lbs. of ground milo-maize heads; and lot 5, 6 lbs. of cotton-seed meal and 50 lbs. of sorghum silage.

These steers made, for the entire period of 140 days, average daily gains per head of 1.94, 2.15, 2.27, 2.44, and 2.07 lbs., at a cost for feed of 7.52, 8.3, 8.09, 9.2, and 7.05 cts. per pound of gain for the respective lots. The average net shrinkage in shipping was 7.6, 5.3, 5.65, 5.53, and 7.16 per cent for the respective lots, while the dressing percentages were 56.89, 57.05, 58.04, 58.46, and 56.55. The net profits per steer were \$1.24, \$1.90, \$3.44, \$0.34, and \$1.18 for the respective lots.

Hogs were placed in several of the pens, but the results indicate that there is danger of loss in having them follow cattle that are receiving full rations of cotton-seed meal. Previous tests indicate, however, that they may follow, with a fair degree of safety, cattle that are receiving only enough cotton-seed meal (from 3 to 4 lbs. for each 1,000 lbs. of live weight per day) to balance their ration.

It is stated that, based on the selling prices of 7.35 cts. per pound for lot 1 and 7.5 cts. for lot 2, cold pressed cotton seed could have cost \$23.90 a ton and proved of equal value to cotton-seed meal at \$28 a ton. Rice bran at \$16.70 a ton proved profitable in supplementing cotton-seed meal and silage and was more profitable for this purpose than ground milo-maize heads at \$20 a ton. In fact, based on the selling prices of 7.65 cts. per pound for lot 3 and 7.75 cts. for lot 4, rice bran could have cost \$22.92 a ton and proved of equal value to the ground milo-maize heads at \$20 a ton. It was very evident that the milo-maize heads, which contained about 75 per cent grain, were much more palatable than the rice bran. When the latter is used it is deemed very important that it be fresh and of good quality and that it be fed during the fall and winter months. During warm weather it becomes rancid very quickly and in such condition cattle do not relish it and it deteriorates in feeding value.

Based on the final weight at Fort Worth, lot 5, that had had access to a shed open on the south side, gained 23 lbs. a head more than lot 1, fed in a similar pen without shelter, both having received the same kind and amount of feed. Had lot 5 sold for 7.35 cts. per pound as did lot 1, there would have been a difference in profit in its favor of \$1.40 a head.

The results of the experiment indicate that "without a greater margin or spread between the prices for feeders and the prices for fat cattle than was had in this case, there is practically no direct profit in feeding cattle with feeds at the prices herein quoted."

**Relation of steer feeding to farm returns,** C. A. WILLSON (*Tennessee Sta. Bul. 114 (1915), pp. 79-110, figs. 6*).—This is a restatement and continuation of work previously noted (*E. S. R.*, 20, p. 665). The primary object of these experiments was to determine the amounts of beef that an acre of land would produce if the crops grown upon it were fed to live stock.

Seven 1-acre plats of the following crop rotations were grown, as follows: Plat 1, soy beans and barley; plat 2, cowpeas and barley; plat 3, corn and barley; plat 4, soy-bean hay and barley; plat 5, soy beans and wheat; plat 6, soy-bean hay and oats; and plat 7, alfalfa. During seven years, from 1908 to 1914, inclusive, the average annual beef production per acre was 508, 451, 434, 435, 402, 456, and 515 lbs., for the respective lots.

The experiments indicated that better results in beef production can be secured from the rotation of soy beans and barley than from any other combination of crops tested. The alfalfa acre ranked first in yield of beef for three years and last for one year. In beef yield it was the ranking acre, but has not been on experiment so long as some of the others. The soy-bean and barley acre ranked ahead of it in gross returns per acre, being first for two years, second for two years, never lowest, and for five of the seven years among the upper half of the acres in beef production. Oats and soy-bean hay have been on experiment for only four years, and although they have made a good showing for that time not enough results have been obtained to warrant the drawing of conclusions. The cowpea and barley acre has not averaged so well as the soy-bean and barley acre. It has never ranked first in production, but has, however, for three years produced more than 500 lbs. of beef per acre. The corn and barley acre thus far has proved to be nearly the poorest of the acres for the production of beef, ranking five years out of the seven in the lower division. The use of corn and barley as a rotation for the growing and finishing of beef cattle is not recommended as compared with soy beans and barley.

The beef produced was valued at 6 cents per pound, the silage fed at \$3 per ton, and it was assumed that there would be a margin of \$1 on 1,000-lb. steers for the 60- to 90-day feeding period. On this basis it is calculated that the gross returns per acre were \$81.23, \$58.94, \$56.92, \$57.07, \$55.90, \$50.23, and \$58.61, for the respective lots.

These experiments were so conducted as also to determine whether it would be better to feed the crops grown in a short feeding period with a heavy ration, or to feed a lighter grain ration and thus extend the time for finishing. When fed for 90 days on the lighter grain ration the average gain per acre was 534, 447, 527, 492, 354, 570, and 515 lbs. for the respective lots, while when fed for 60 days on a heavy ration the average gains per acre were 375, 453, 361, 277, 417, and 417 lbs. for the respective lots. The steers on the 90-day feed made 33 per cent larger gains than the steers on the 60-day feed, owing to a greater utilization of the roughages grown on each acre. Also the increased finish which the steers on 90-day feed put on would probably make them bring from 0.25 to 0.5 ct. more per pound than the steers on 60-day feed.

Data on the prices obtained for grains and hay by marketing through steers by the foregoing methods are given, also the prices the grains must sell at when not fed to make up for fertility returned by steers when fed.

**Profits and losses in cattle feeding** (*Wallaces' Farmer*, 41 (1916), No. 10, p. 398, fig. 1).—A chart is given which shows the relation over a long period of years between cattle and corn prices. During 1914 and 1915 cattle lost money to the average feeder. During January, 1916, the loss was about \$13 per head and during February about \$12. Better conditions for the near future are indicated.

**Calf-feeding experiments** (*Agr. Gaz. [London], 83 (1916), No. 2201, pp. 151, 152*).—In experiments conducted at the college farm at Kilmarnock, Scotland, one lot of 4 calves was fed on new milk, the actual quantity of whole milk consumed being equivalent to an average of 1.75 gal. per calf per day over the whole experimental period. Hay was fed ad libitum from the time the calves were six weeks old, and linseed cake was introduced when the calves were eight weeks old. In one trial the calves made an average weekly gain per calf of 14.8 lbs. for the 16-week period, while in a second trial they made 12.6 lbs.

Another lot of calves, which were fed whole milk for the first four weeks and then gradually changed to a ration consisting of an average of 2 gal. of separated milk and 0.75 lb. of crushed oats, together with hay and linseed cake, made during one trial an average weekly gain of 12.7 lbs. per head and during a second trial 12.1 lbs. A third lot of calves which were fed an average of 2 gal. of separated milk and 0.5 lb. of maize meal per calf per day, together with hay and linseed cake, made average weekly gains of 12 lbs. per head during one trial and of 12.1 lbs. during a second trial.

A fourth lot of calves was fed an average of 1.75 gal. of whey and 2 lbs. of calf meal per calf per day. The calves did not care for the whey and it had a tendency to scour them. These calves made an average weekly gain of 9.5 lbs. per calf during one trial and of 9.7 lbs. in a second trial. This ration was in no way as satisfactory as the others.

Excellent results were obtained from the separated milk with either crushed oats or maize meal, fed as gruel, and it is stated that if separated milk is available it is doubtful if anything better is needed.

**Methods of handling sheep in California**, F. A. ELLENWOOD (*Nat. Wood Grower, 6 (1916), No. 1, pp. 19-22*).—Results of experiments are given which show more rapid gains by hot-iron docked lambs than by knife docked lambs.

**Lambing methods in national forests of Southwest**, R. R. HILL (*Nat. Wood Grower, 6 (1916), No. 3, pp. 7-10, figs. 2*).—The author compares the open-range and the pasture and corral methods of lambing.

It has been found that the open-range method of lambing is not economical on the mountain ranges of the national forests in the Southwest. The best method of lambing is, theoretically, in coyote-proof pastures, but in practice the best method to adopt on the average allotment in the Southwest is to lamb in corrals and pastures in connection with the open range. The advantages of the improved methods of lambing over the open-range method are (1) an increase of from 3 to 7 per cent in the number of lambs secured; (2) improved conditions for the development of the lamb during the most critical period of its life; (3) a net saving of approximately 20 cts. per head on the ewes to lamb; and (4) the protection of the season's growth of forage, insuring that it will be available for lambing when needed.

The cost of constructing all improvements necessary for lambing a band of 1,000 ewes should not exceed \$1,000. The amount of range required for such a band during the five-week lambing period would vary from 3 to 5 sections, according to the character of the forage and the general topography. The number of acres that should be inclosed would vary from 140 to 200 acres. The pasture and corral method of lambing is well adapted to any sized outfit and to any ordinary type of range commonly used for lambing in the Southwest.

**Improved management of national forest stock**, W. C. BARNES (*Nat. Wood Grower, 6 (1916), No. 1, pp. 23-27*).—This is a discussion of some of the principal problems which have been investigated by the grazing division of the Forest Service of the U. S. Department of Agriculture. It includes the open herding system of sheep grazing, pasture and sheds for range lambing, grazing

sheep without water, deferred and rotation grazing, and general improvement of the grazing areas.

**Corriedale sheep record association** (*Breeder's Gaz.*, 69 (1916), No. 7, p. 374).—Announcement is made of the organization of the American Corriedale Association. This association will maintain a flock book for all Corriedale sheep tracing in an unbroken line through both parents to Corriedale flocks recognized by the Sheep Breeders' Association of New Zealand.

**A demonstration test of swine rations** (*Breeder's Gaz.*, 69 (1916), No. 5, p. 243, fig. 1).—In a demonstration test at the Indiana Experiment Station showing the value of supplementary corn for fattening hogs, 2 hogs from each of 3 lots of 10 79-lb. pigs were butchered after a 70-day test and the carcasses displayed. Lot 1, receiving corn alone, averaged during the 70-day period 20 lbs. gain per head, costing 8.64 cts. per pound of gain; lot 2, on corn and tankage, 94 lbs. gain, costing 3.92 cts. per pound; and lot 3, on corn and buttermilk, 128 lbs. gain, costing 4.08 cts. per pound.

**Clover meal as a feed for swine**, A. ZUR HORST (*Deut. Landw. Tierzucht*, 20 (1916), No. 2, pp. 10-12).—A ration composed of clover meal, potatoes, meat meal, acorns, and beets proved a very satisfactory feed for fattening swine.

**A study of hog profits and losses** (*Wallaces' Farmer*, 41 (1916), No. 5, p. 155, fig. 1).—A graphic illustration is given of the fluctuation of hog prices over a period of twelve years, with the corresponding profit or loss to the producer.

**Meat and blood meal as a supplement to oats for horses**, WESTMATELMANN (*Deut. Tierärztl. Wchnschr.*, 24 (1916), No. 8, pp. 63, 70).—Successful trials in feeding 10 lbs. per day per horse of a mixture of 20 lbs. of dried stomach contents, 20 lbs. of blood, 20 lbs. of meat meal, 2 liters of brewery yeast, 7 lbs. of sugar, 1 lb. of salt, and 30 lbs. of oats are reported. It took several weeks for the horses to become accustomed to the feed, but after this time they put on weight and muscle. A ration composed of 2 lbs. of meat meal, 2 lbs. of oats, 3 lbs. of sugar, and 3.5 lbs. of bran per head per day also gave satisfactory results.

**Breeding and training of the horse**, G. BONNEFONT (*Élevage et Dressage du Cheval*. Paris: J. B. Baillière & Sons, 1914, 2. ed., pp. 440, figs. 228).—This book treats of the breeding and management of the various breeds of light and draft horses and of their training for harness, draft, and army purposes.

**Mechanics applied to the race horse**, H. COUSTE, trans. by E. B. CASSATT (*New York*: 1916, pp. 80, pl. 1, figs. 10).—This is a translation of the second edition of this work and treats of the conformation of the race horse and the mechanics involved in the various gaits and in jumping.

**The sensation of the Percheron world** (*Breeder's Gaz.*, 69 (1916), No. 6, pp. 309, 310, figs. 2).—An account of the recent deal in which a half interest in the 11-year-old Percheron stallion Carnot is reported to have been sold for \$20,000. The history of this well-known stallion is given.

**The Missouri Poultry Experiment Station**, T. C. PATTERSON (*Breeder's Gaz.*, 69 (1916), No. 7, pp. 367, 368, figs. 10).—A discussion of the situation, equipment, and work of the Missouri State Poultry Experiment Station, at Mountain Grove, Mo.

From observations for several years of egg-laying contests the author believes that more depends on the strain than on the variety, for it is not uncommon with two pens side by side of the same variety for one to average perhaps 150 eggs per hen, while the other pen averages only 80 or 90 eggs. The difference seems to be that one man has carefully selected and bred for egg production, while the other has not. Another point of importance is the uniformity of size, shape, and color of the eggs. The strain seems to influence his as much as the number of eggs produced.

Contrary to popular belief, the heaviest layers were the lightest eaters, and the hen laying the greatest number of eggs consumed the smallest amount of feed. It seems to be the hen's ability to utilize the feed she eats as much as the quantity eaten. The balancing of the ration also evidently has much to do with egg production.

It has been found that the color of a fowl does not influence egg production. One Buff Leghorn pullet laid more than 200 eggs in one year—more than all others in her class. The week before the contests began she was entered in a poultry show and was the highest-scoring bird in her class. One reason for the belief that high-producing hens are rough and ugly is that they usually are viewed and pictured after the year's work is done. At the beginning of the contest many of the high producers were high-scoring.

It is stated that the popular theory that the larger birds lay large eggs is incorrect. Where all the eggs were weighed it showed that the Ancona, which is smaller than the Leghorn, laid the largest egg of all the breeds tested. Another theory is that the medium-sized or all-purpose breeds do not lay as many eggs as the egg breeds, like the Mediterraneans. One reason given is that the all-purpose breeds lose time brooding, but the records show that the Wyandottes laid the greatest number of eggs and also went broody the greatest number of times.

Can selection cause genetic change? W. E. CASTLE (*Amer. Nat.*, 59 (1916), No. 592, pp. 248-256).—This is a continuation of the discussion previously referred to (E. S. R., 34, p. 564) on fecundity in the domestic fowl and the selection problem.

A feminized cockerel, H. D. GOODALE (*Jour. Expt. Zool.*, 20 (1916), No. 3, pp. 421-428, figs. 7).—A Brown Leghorn chick was castrated by making an incision on each side and carefully removing the testes. Particular care was taken to see that all testicular matter was removed. Just previous to the operation on this bird the ovaries had been removed from two pullets of the same strain belonging to the same brood and placed in moist cotton. They were cut in several pieces and dropped into the abdominal cavity of the cockerel on each side. No attempt was made to suture the pieces in place.

The bird developed a general feminine appearance except that it grew somewhat long-legged and rangy, as a cockerel would do. The spurs remained undeveloped a long time. When the adult plumage came in it lost some of its nondescript character and in most sections was clearly that of the normal female. The chief difference lay in the feathers of the dorsal regions, which were black with relatively few minute brown spots instead of the uniform mixtures of minute dull black and brown spots characteristic of the Brown Leghorn female.

Later the bird was killed and the autopsy showed the following findings: Weight, 3 lbs. 7 oz.; oviduct not found, nor were vasa deferentia; spleen hypertrophied; very little body fat; bursa fabricii not found. Ovarian tissue was found in the following positions: On the left side one piece was attached to the body wall, ribs, and transverse septum and inclosed in a serum-filled sack. The ova were very small, not more than a millimeter in diameter. A second mass lay on the surface of the kidney just lateral to the junction of the iliac with the vena cava. Four of the pieces placed on the right side were found to have become attached, three of them in the form of elongated masses, one attached to the ribs, another to the transverse septum and liver, while the third was attached to the mid-dorsal mesentery at the level of the adrenal. The fourth had adhered to the outer body wall. Some of the ova on this side reached 3 mm. in diameter. There were no evidences of empty follicles. The blood supply of the pieces of ovum on this side was well developed.

It is the opinion of the author that "the difference between the secondary sexual characters of the sexes can not be ascribed solely to the internal secretions, but that the genetic basis of each character must also be taken into consideration. At least four groups of characters can be recognized: Head furnishings, dependent in the male upon the testes, in the female independent of the ovary in certain respects, in other respects dependent; spurs independent of testes, but on which the ovary exerts an inhibition, often incomplete; voice and behavior, which in the male is partially dependent and partially independent of the testes, yet closely correlated with these; and plumage, which is independent of the male organs, but on which the ovary exerts a modifying influence.

"Since the male may be feminized, it follows that if the ovary be considered an inhibitor merely, then the male must possess both potentialities for the secondary sexual characters and that the ovarian secretion suppresses the male character, allowing the female plumage to develop. Genetically, then, the male secondary sexual characters must be considered dominant to the female. On the other hand, if the ovarian secretion be considered a modifier, transforming the male character into the female, we need not assume that both potentialities exist in the male, but only the one. We may also make a similar assumption for the normal female. At present it is impossible to determine whether or not the ovarian secretion is an inhibitor or modifier."

The feeding of young chicks on grain mixtures of high and low lysin content, G. D. BUCKNER, E. H. NOLLAU, and J. H. KASTLE (*Kentucky Sta. Bul.* 194 (1916), pp. 3-21, figs. 16; *Amer. Jour. Physiol.*, 39 (1915), No. 2, pp. 162-171, pl. 1).—Two lots of chicks were fed eight weeks, lot 1 receiving a mash twice a day, morning and evening, consisting of equal parts by weight of finely ground wheat, wheat bran, sunflower seed, and hemp seed, moistened with sour skim milk, and once a day at noon they were given a coarsely-ground grain mixture of wheat, hemp seed, and cracked corn. Lot 2 received a mash consisting of finely-ground barley, rice, hominy, and oats, 100 gm. each, and 56 gm. of gluten flour, and prepared with protein-free milk, and at noon a mixture of equal parts of barley, rice, and hominy. The lysin content of the ration fed to lot 1 was 3.8 per cent of the total nitrogen for the mash and 2.23 per cent for the grain; lot 2, 0.5 per cent for the mash and 0.79 for the grain.

Five of the chickens of lot 1 at the conclusion of the experiment weighed 2,553 gm., whereas 7 chickens in lot 2 weighed 1,195 gm. There were marked differences in the feathering of the two lots of chickens, lot 1 showing the feathering characteristic of the mature chicken, whereas lot 2 still showed the feathering of the young and immature chick at the conclusion of the experiment. Great difference in the two lots of chickens was also shown in their general activity during the progress of the experiment, the chickens of lot 1 being greatly more active than the chickens of lot 2. It was also observed that the chickens of lot 2 consumed more charcoal than the chickens of lot 1.

It is stated that the desire showed by the young chick for hemp seed is remarkable. It has been observed that out of a grain mixture containing this material they will pick out every hemp seed before eating the remainder of the ration. Of all the substances used in the feeding experiments hemp seed is richest in lysin.

The lots were then reversed, the chickens of lot 2 receiving the ration of lot 1 and lot 1 the ration of lot 2. At the end of a week the chickens of lot 2 were found to weigh 1,589 gm., an increase in seven days of 41.2 gm. per chick, as compared with an average gain per week of 15.9 gm. during the regular period of the experiment. It is stated that this rapid increase in

weight indicates that while growth was stunted on the first ration the chickens still possessed the power to grow rapidly on the ration of lot 1. The difference in the nutrition in these two lots of chicks is deemed due, in all probability, to the difference in the amount of lysin received by the two lots, and possibly to a difference in the quantity and nature of the fats contained in the two rations. The mash fed to the chicks of lot 1 contained 13.08 per cent of fat, and the dry grain mixture 8.21 per cent, whereas the mash fed to the chicks of lot 2 contained only 1.8 per cent of fat and the grain mixture 1 per cent.

In order to determine to what extent the difference shown by the two lots was due to difference in the protein or fats two lots of chicks were fed for 60 days the same rations as in the foregoing experiment except that to the ration supplied to lot 2 there was added sufficient butter fat to bring the fat content up to that of the ration fed to lot 1. The chickens of lot 1 showed an average gain per chick of 277.3 gm. over the chickens of lot 2. The differences shown by these two lots of chicks at the end of the feeding period were very striking. The chickens of lot 1 were strong, growthy, and perfectly feathered in contrast to the chicks of lot 2, which, although in perfect health, were markedly stunted in their growth and showed the feathering characteristics of a much younger chick and the yellow color and appearance of the newly-hatched chick about the head and neck. The external sexual characteristics of these two lots also showed most striking differences. In lot 1 the cockerels were easily distinguished from the hens and both showed well-developed, highly colored gills and combs, whereas the chicks of lot 2 showed no well-developed external sexual characteristics whatever, the combs of both sexes being rudimentary and colorless.

These two lots were reversed, as in the first experiment, and the average percentage gains of lot 1 were 5.1 against 28.9 for lot 2. Within one week after reversing the rations fed to lots 1 and 2 the external sexual characteristics of the chicks of lot 2 became noticeable, and at the end of three weeks were very pronounced.

It is deemed evident from these results that the marked differences shown by these two lots of chicks in the rate of growth and development can not be ascribed to the fat content of the two rations, but rather to differences in the amino-acid content of the two rations and in all probability to difference in the lysin content.

**When to feed the baby chick.** B. F. KAUFF (*North Carolina Sta. Bul.* 235 (1916), pp. 13-15, figs. 7).—Studies were made to determine how much of the abdominal yolk was absorbed in the embryonic stage in the shell, or in other words, to determine how much food was left in the abdominal yolk at hatching.

The weights were taken of 1,434 White Leghorn eggs, the average being 57.7 gm. By boiling the egg and weighing it was found that the average weight of 10 yolks was 17.78 gm. In a study of ten baby chicks that had started to pip out of the shell but had died, it was found that the unabsorbed yolk weighed, on an average, 8.5 gm., or 47 per cent unabsorbed. There appeared to be no constant definite weight of the amount of yolk left in the yolk sac unabsorbed at this period of the chick's life. The weights varied from 8 to 10 gm., and it was found that the rate of absorption of the yolk varied in different individuals.

Forty chicks were killed by the aid of chloroform at different ages, skinned, and the carcasses immediately placed in a 10 per cent solution of formaldehyde. Later these carcasses were sectioned longitudinally for the purpose of making a study of the relation of visceral organs with respect to the abdominal yolk sac.

From this study it was concluded that nature has made ample provision in supplying a generous store of food to keep the baby chick well nourished until the brood has hatched, and that this supply of nutrients is sufficient to carry nutrition on until the bird becomes strong. "From the study of the rapidity of absorption of the abdominal yolk it appears clear that if baby chicks be fed as soon as hatched there is likely to be trouble. If the stomach, gizzard, and intestines become gorged with food it is certain to place more or less pressure on the abdominal nerves and blood and lymph vessels, and thus the function of these vital structures will be interfered with and in some cases cause death."

Five experiments were run in which the baby chicks were left in the nursery tray until they were 72 hours old. They were then placed in outdoor brooders and given nothing but buttermilk to drink for the next 24 hours, and during the next 24 hours (the fifth day) were given only two light feeds with the milk. On the sixth day they were placed on full feed. These chicks thrived better and were stronger and more resistant to chick troubles than their controls.

It is suggested that in the case of sitting hens it is advisable to give milk the first day after taking the hen from the nest and light feed for the next two days, after which the chicks may be placed on full feed with safety.

By using the combination sitting and brooding coops the hen may be fed from a high can, such as an oyster can, and the baby chicks fed in their compartment, as desired and without being interfered with by larger fowls or the mother.

**Poultry raising in Wisconsin**, J. G. HALPIN and J. B. HAYES (*Wisconsin Sta. Bul.* 261 (1916), pp. 3-35, figs. 13).—A popular discussion of methods of poultry raising under Wisconsin conditions.

**Ostrich breeding**, A. SOKOLOWSKY (*Berlin. Tierärztl. Wchnschr.*, 32 (1916), No. 4, pp. 37-41, figs. 3).—Methods of breeding, feeding, care, and management of ostriches in German Southwest Africa are described.

**A successful experiment in skunk farming**, H. D. JONES (*Sci. Amer.*, 114 (1916), No. 14, pp. 346, 366, figs. 5).—An account of methods adopted in conducting a skunk farm as a profitable business enterprise.

### DAIRY FARMING—DAIRYING.

**Feeding experiments with dairy cattle**, H. GOLDSCHMIDT (*Tidsskr. Landökonomi*, No. 4 (1915), pp. 180-196; obs. in *Zentbl. Agr. Chem.*, 44 (1915), No. 7, pp. 334-336).—This article reports experiments in the economical feeding of dairy cattle in Denmark, in which the value of oil cake, molasses feed, beets, and straw was demonstrated.

**The utilization of beets in cattle feeding**, L. MALPEAUX (*Vie Agr. et Rurale*, 6 (1916), No. 2, pp. 27-33, figs. 4).—In feeding experiments with dairy cows it was found that the feeding of whole beets produced a somewhat larger yield of milk and milk fat than when chopped beets were fed, this increase probably being due to more complete mastication and utilization.

**The utilization of cassava flour in the feeding of dairy cattle**, J. E. LUCAS (*Bul. Econ. Govt. Gen. Madagascar*, 15 (1915), I, No. 1, pp. 67-71).—The partial substitution of cassava flour in the ordinary grain ration for dairy cattle resulted in an increased milk and milk fat yield and in a greater live weight of the animals so fed.

**The value of cod liver meal as a dairy cattle feed**, H. ISAACHSEN, E. FRIDRICHSEN, A. LALIM, and INGEBORG K. WOLD (*Ber. Foringsforsoks Stat. [Norges] Landbrukshöskolen*, 9 (1913-14), pp. 1-52, figs. 5; obs. in *Zentbl. Agr. Chem.*, 44 (1915), No. 7, pp. 330-333).—The composition of cod liver meal is given as dry matter 92.53, protein 50.69, fat 31.43, ash 2.52, and other constituents 7.89

per cent. The feeding of this material to dairy cattle resulted in increased milk and fat yields.

**The feeding of sesame cake to dairy cattle**, R. GIULIANI (*Ann. Ist. Agr. [Milan]*, 12 (1913-14), pp. 1-69).—Experiments in the feeding of sesame cake to dairy cattle resulted in increased milk and fat yields. Butter was produced sooner and at a lower temperature from cream from cows fed sesame cake than from those fed linseed cake. The Polenske and Reichert-Meissl numbers were lowered.

**The work of the agricultural colleges and experiment stations in its relation to a better milk supply**, W. A. STOCKING (*Milk Dealer*, 5 (1916), No. 6, pp. 20-23, fig. 1).—This paper has been previously referred to (E. S. R., 33, p. 702).

Data collected in inspection work in Ithaca, N. Y., are presented. It is shown that at the beginning of the inspection work in 1907, 98 farmers were producing milk for the city. Of this number, 31 had milk houses, 4 used a small-top milk pail, and 1 used a damp cloth for wiping the udder just before milking. In 1914 there were 124 producers, of whom 62 had suitable milk houses, 60 used small-top milk pails, and 12 used a damp cloth. During all this period, it has been the purpose of the inspectors to give as much assistance as possible, both to producers and dealers, and improvements made are attributed to friendly cooperation and assistance.

**Milk and cream contests**, E. KELLY, L. B. COOK, and J. A. GAMBLE (*U. S. Dept. Agr. Bul.* 356 (1916), pp. 23).—The subjects discussed in this bulletin are national contests, how contests are conducted, educational features, exhibitions, average scores of recent contests, and benefits of milk contests to dairymen. Suggestions are given for the production of contest milk.

**[Use of milk and milk products]** (*Cong. Rec.*, 53 (1916), No. 87, pp. 6039-6042).—This reviews statements from various dairy experts, agricultural authorities, farm journals, and newspapers on the condition of the milk supply in this country and the need for more effective inspection and legislation.

**Experiments in pasteurizing milk by means of the "universal pasteurizer" in Denmark**, A. V. LUND (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg [Copenhagen]*, 86 (1914), pp. 56-72, fig. 1; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 7, pp. 986-988).—In Denmark, under the law dealing with the combating of tuberculosis in domestic animals, the pasteurization is obligatory of all skim milk and butter-milk given to cattle, so that it gives a negative reaction to Storch's test (E. S. R., 10, p. 384); i. e., the milk must be heated to at least 80° C. The apparatus often used is the so-called "universal pasteurizer," a regenerative heating apparatus in which the milk, after being heated, is cooled before leaving the pasteurizer.

In experiments it was found that if the milk from an ordinary pasteurizer has, on reaching the weighing receptacle, a temperature that would allow a positive reaction to Storch's test, the capacity for such reaction can be neutralized by the subsequent admission into the vessel of superheated milk. This, however, can not happen if the milk comes from the "universal pasteurizer" or similar apparatus, hence if milk capable of giving a positive reaction enters the weighing receptacle it retains that capacity in spite of any subsequent rise, however great, in the pasteurizer itself. The reading of the thermometer on the "universal pasteurizer," taken at the same time as the sample, thus affords no evidence as to how the milk in the weighing receptacle will react. A relatively small quantity of milk capable of positive reaction can, when added to the milk in the weighing receptacle, cause the latter to react.

Hence, as mixing is continually taking place, the milk in the receptacle can give a positive reaction a considerable time (even several hours) after the actual milk capable of causing the reaction has emerged from the pasteurizer.

As the various milk particles probably have somewhat different temperatures when they reach the top of the "universal pasteurizer," and the thermometer can only register one temperature at a given moment, the latter must always be higher than the critical temperature of the reaction (from 80° to 81°) in order that the least warmed particles of the milk, and consequently the whole bulk of the milk, shall not give a positive reaction. For this reason the maker now makes a point of mentioning in the directions for using his apparatus that the thermometer should always register at least 83° if the milk is to pass Storch's test. It is thought that this precaution will be all that is needed, and the working of the machine is not affected thereby. The rapidity with which the milk cools after being heated seems to have no effect upon its reactive capacity.

The milk of Jersey cows and of goats behaved in a precisely similar manner to that of Danish cows in respect to its reaction to the Storch test.

**The control of the degree of acidity, the catalase, and the reductase by biorization.** W. D. KOOPER (*Milk, Ztg. [Hüdesheim]*, 29 (1915), Nos. 76, pp. 959-961; 77, pp. 973, 974).—Data are presented which indicate that biorization materially reduces the formation of acid in milk, destroys bacteria, and improves the keeping quality of milk.

**Experiments in cheese making from milks of different fat contents.** A. V. LUND (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg [Copenhagen]*, 86 (1914), pp. 73-97; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 988-990).—In cheese investigations it has been found that the coefficient of the cheese, i. e. the relation between the fat content and the casein content, can be very accurately estimated from the fat percentage of the "cheese milk" and, conversely, that the fat percentage can be calculated from the coefficient. The factor to be used in the case of the milk of ordinary Danish cows is 37.5.

It follows that the coefficients of the different kinds of cheese known commercially as whole-milk cheese, half and quarter whole-milk cheese, and skim-milk cheese are sufficiently distinct to allow of the various kinds being distinguished by this means. In spite of the very considerable variations in the values of the same sort of cheese it has been found that the minimum values found for whole-milk cheeses are higher than the maximum values for half whole-milk cheeses, while the minimum values for the latter are in their turn higher than the maximum values of quarter whole-milk cheese, and so on. Such factors as whether the cheese is made with pasteurized or unpasteurized milk, and whether the curd is coarsely or finely divided, exert some influence upon the coefficient of the cheese, but not to the extent of appreciably modifying the above conclusions.

The coefficients remain almost the same whether the cheese analyzed is fresh or has been kept some time. The method of storing also has little effect upon the coefficients as determined by analysis. As the coefficients determined by the experiments are merely experimental figures, and do not correspond to the conditions obtaining in practical cheese making, in trade, or at exhibitions, they can not be used as type values, but may serve as guides for the determination of the latter.

The yield of cheese can be roughly estimated when the amount of fat and casein in the cheese milk is known. Cheeses made from the milk of Jersey cows were found to have higher coefficients than those made from the milk of

ordinary Danish cows; yet the coefficients of the former were relatively too low, owing to the large amount of casein in the milk of Jersey cows. In the case of the milk of the Jersey cow the factor 37.5 given above must be replaced by the factor 30. The milk of Jersey cows gave a much larger cheese yield than ordinary milk, this being due to the larger fat and casein content of the former. Judging from a single examination there is no characteristic difference between the quality of cheese made from the milk of Jersey cows and that made from the milk of ordinary Danish cows.

Any given cheese milk can be altered by the addition of skim milk or whole milk (or even cream) in such a way as to obtain the desired coefficient in the cheese to be produced.

### VETERINARY MEDICINE.

**Lymphatic glands in meat-producing animals**, P. GODBILLE, trans. by A. F. LIAUTAUD and D. A. HUGHES (New York: William R. Jenkins Co. [1915], pp. 175, figs. 17).—The first part of this work (pp. 17-109) deals with the topographic anatomy of the lymphatic glands in food-producing animals, including cattle, swine, sheep, and horses, and the second part (pp. 111-164) with the normal appearance of these glands in meat-producing animals and the pathological alterations occurring in them.

**A practicum of bacteriology and protozoology**.—I, **Bacteriology**, K. KISSKALT (*Praktikum der Bakteriologie und Protozoologie. I, Bakteriologie. Jena: Gustav Fischer, 1914, 3. ed., pp. VIII+112, figs. 40*).—The third edition of the first part of this compend, previously noted (E. S. R., 26, p. 882).

**Yearly reports in regard to the progress made in veterinary medicine**, edited by W. ELLENBERGER, W. SCHÜTZ, and O. ZIEZSCHMANN (*Jahresber. Vet. Med., 33 (1913), pp. V+423; 34 (1914), pp. VII+297*).—These reports covering the years 1913 and 1914 are in continuation of that previously noted (E. S. R., 29, p. 581).

**Wound treatment**, L. A. MERRILLAT, E. W. HOARE, ET AL. (*Chicago: Amer. Jour. Vet. Med., 1915, pp. 186*).—This work consists of articles on wounds and wound treatment by a number of authors.

**Antiseptic methods employed in the treatment of infected wounds based on a bacteriological examination of the pus**, CAZIN and MILE S. KRONGOLD (*Compt. Rend. Acad. Sci. [Paris], 162 (1916), No. 2, pp. 89-91*).—In the treatment of wounds, in which *Bacillus pyocyaneus*, staphylococcus associated with various diplococci, and other common bacteria were found, a solution of silver nitrate (1:200,000) yielded the most satisfactory results. For suppurative, gangrenous wounds in which *B. perfringens*, tetragenæ, anaerobic streptococci, *B. coli*, and others were found, hypochlorite solutions were necessary. The solutions used were those prepared according to Dakin's method and the water of Javelle. The latter gave the best results in a concentration of 15 gm. per liter of distilled water, stronger solutions being found to produce irritation of the skin after prolonged use. Dakin's hypochlorite solution was not as strongly bactericidal as the water of Javelle, but does not irritate the skin and can be used continuously for several weeks. Favorable results are also reported with the polyvalent serum of Leclainche and Vallée.

**The germicidal power of glycerin on various micro-organisms under various conditions**, E. H. RUEDIGER (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 6, pp. 465-477*).—"Glycerin has a distinct, although feeble germicidal action. The germicidal action varies greatly with the temperature, being much feebler at a temperature of 15° C. than at from 30 to 35°. The germicidal action varies

with the diluent employed; in glycerin diluted with physiologic salt solution the micro-organisms died much sooner than in glycerin diluted with bouillon or with horse serum. In dilutions up to 50 per cent, glycerin did not destroy the bacillus of anthrax in 15 days. This may be due to the presence of spores. Glycerin seems to be a selective poison for the bacillus of plague, the spirillum of cholera, and the bacillus of diphtheria. In 50 per cent of glycerin in physiologic salt solution all the nonspore-forming organisms died in less than 4 days."

**Changes of bacteria on the animal body** (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 74 (1914), No. 3-4, pp. 285-294; 75 (1914), No. 2, pp. 159-173; 75 (1915), No. 5-6, pp. 394-398; 76 (1915), Nos. 1, pp. 38-46; 5, pp. 330-342).—The present papers, in continuation of a series on the subject, include an experiment on the formation of the capsule of the anthrax bacillus, by K. Rotky (pp. 285-294); the correlation between capsule formation, spore formation, and infectivity of the anthrax bacillus, by O. Bail (pp. 159-173); experiments on the power of resistance of capsulated and capsule-free anthrax bacilli, by J. Matsui (pp. 394-398); investigations of capsule-free anthrax, by O. Bail (pp. 38-46); and tests of the attenuation of the anthrax bacillus at 42°, by O. Bail (pp. 330-342).

**Complement fixation in varicella**, J. A. KOLMER (*Jour. Immunol.*, 1 (1916), No. 1, pp. 51-58).—While the experiments reported have shown that "an antibody in the nature of an amboceptor is present in the sera of persons suffering with varicella which will absorb complement in the presence of an antigen prepared of the cutaneous lesions of this disease, yet the percentage of positive reactions and particularly the degree of complement absorption is small. While immunity principles are in all probability present in the body fluids of persons for years after an attack of varicella these could not be detected by the complement-fixation tests in this study. All positive reactions were observed during or soon after an attack of the disease and at the time of probable highest concentration of antibodies. A more delicate technique would probably yield a higher percentage of positive reactions as is usual in all complement-fixation tests with bacterial antigens, but in this study this was avoided in order to guard against the possibility of nonspecific absorption of complement."

**Complement fixation in vaccinia and variola**, J. A. KOLMER (*Jour. Immunol.*, 1 (1916), No. 1, pp. 59-81).—Experiments reported show that about 60 per cent of the sera examined from patients suffering with mild smallpox yielded positive complement-fixation reactions with salt-solution antigens of variolous and cowpox viruses. Although the reactions in general were relatively weak those with the variolous antigens were somewhat stronger than those with the cowpox antigens. Alcohol extracts of variolous and cowpox viruses possessed little or no antigenic sensitiveness.

"These complement-fixation reactions have demonstrated the close biological relationship between the antibodies of vaccinia and variola; it is probable that complement-fixation reactions with salt-solution antigens of the contents of smallpox lesions or fresh cowpox virus will prove of some value in the diagnosis of smallpox."

**The fate of various antibodies in the precipitin reaction**, F. P. GAY and RUTH L. STONE (*Jour. Immunol.*, 1 (1916), No. 1, pp. 83-104).—The authors were unsuccessful in an attempt to separate out antibodies in a condition relatively free from other proteins. Their experiments have shown that most bacteriolysins and hemolysins, when associated either with the precipitogen serum or with the precipitin serum, are not carried down in the precipitate. Similar negative results were obtained with artificial bacterial agglutinins and hemagglutinins. When the precipitate was produced by adding serum to

its antiserum the fixation complex was generally shown to be present in the precipitate. The fixation complex may, however, be present in the supernatant fluid, and was in most instances so found when a bacterial extract was added to an immune serum.

"In certain combinations it seems definitely shown that the fixation complex is present in that fraction (supernatant or precipitate) in which the protective bodies are absent. Thus in the case of pneumococcus precipitate produced by adding the extract of pneumococcus to antiserum from the horse, the protective bodies are present in the precipitate and the fixation complex is present in the supernatant fluid. The exact reverse is true in a combination of rabbit antihorse serum and horse antipneumococcus serum."

A bibliography of 28 references is appended.

**Kidney lesions in chronic anaphylaxis.** T. H. BOUGHTON (*Jour. Immunol.*, 1 (1916), No. 1, pp. 105-118, figs. 5).—Material examined from 23 guinea pigs demonstrated that "repeated anaphylactic shock induced . . . by injections of egg white or beef serum is able to produce lesions of the kidney that are not produced by acute anaphylaxis, nor by the repeated injection of these proteins in refractory animals. These lesions consist principally of necrosis of tubular epithelium, proliferation of glomerular capillary endothelium, and swelling and degeneration of the intima and media of small vessels. Small diffusely scattered areas of round-celled infiltration were observed in nearly all cases, somewhat similar to the areas observed in the controls, but usually larger, and invariably much more numerous than the spontaneous lesions. In this series the lesions noted are to be considered as subacute rather than chronic."

**Biological researches on the eosinophils.** M. WEINBERG and P. SÉGUIN (*Ann. Inst. Pasteur*, 28 (1914), No. 5, pp. 470-508, pls. 2).—From the investigation the authors have shown that the eosinophils, as well as the other white cells, possess chemotactic properties for certain toxic substances, as well as the original parasite, to an even greater extent than the other leucocytes. When the "cosinotactic" substances are absorbed in the infected tissue they cause a stimulation to the production of a large number of eosinophils and thus produce a local eosinophilia. This local action does not depend entirely on the toxic substance or parasites, but more especially on the number of eosinophils in the blood of the experimental animal. When they are present in great numbers the cosinotactic substances apparently cause an afflux of polynuclear neutrophils. This result has also been obtained by injecting helminth products in the conjunctival tissue of the horse or in the muscle of the guinea pig. Intraperitoneal injection of such toxins into guinea pigs does not produce an afflux of eosinophils from the blood in the peritoneal exudate, since the eosinophils are arrested in the neighboring tissues of the peritoneum and thus constitute a local eosinophilia.

The intense local eosinophilia observed in the phenomenon of Arthus, attributed by some investigators to the chemotactic action of the eosinophils, has not been definitely determined. Injection into the peritoneal cavity does not produce a local eosinophilia in the lungs of the animal which survives the anaphylactic shock. The pulmonary eosinophilia, which is considered as a characteristic lesion of nonfatal anaphylaxis by some, preexists to a large extent as an eosinophilia in the blood. Such a condition manifests itself about 15 minutes after the injection of a sensitized guinea pig, and is considered a natural consequence of anaphylaxis. The direct action of the antigen on the hematopoietic center seems thus to be explained.

**Biological researches on the eosinophils, II.** M. WEINBERG and P. SÉGUIN (*Ann. Inst. Pasteur*, 29 (1915), No. 7, pp. 323-346, pls. 2; *abs. in Jour. Roy.*

*Micros. Soc.*, No. 5 (1915), p. 508).—Continuing the investigation noted above, the authors have shown that the eosinophils possess phagocytic properties and are not only capable of ingesting inert material and bacteria but also protozoa and erythrocytes. The results obtained with *Bacillus subtilis*, *B. coli*, certain protozoa, and the red cells indicate that they are not only ingested but also completely digested. The eosinophilic phagocytosis takes place both in vitro and in vivo (peritoneal cavity, subcutaneous tissue, and circulating blood of the guinea pig).

When the eosinophils are very abundant in the blood, or when they accumulate at the point of inoculation, they play a very important part in the immediate protection of the organism against infection. When placed in contact with the fluid from a hydatid cyst for 1 hour at 37° C. they lose their phagocytic properties, while the neutrophils and mononuclears are still strongly phagocytic. If a sufficient number are brought in contact with such a fluid it finally loses its antigenic properties, as is easily demonstrated by the complement-fixation reaction with a fresh echinococcus serum and a normal hydatid fluid as controls. Those of immunized animals were found to absorb the hydatid antigen more readily than those of normal animals. While possessing these properties they still play only a supplementary rôle in the actual process of phagocytosis.

It is concluded that the eosinophil leucocytes, together with the polymuclear neutrophils, are an important factor in immunity. Although the principal function of the neutrophils is to protect the organism against the invading micro-organisms, the eosinophils are especially adapted for neutralizing certain toxic products. The elaboration of the specific antibodies is probably the result of the absorption of toxic products.

Toxins of intestinal parasites, D. E. PAULIAN (*Presse Méd. [Paris]*, No. 49 (1915), p. 463; *abs. in Jour. Amer. Med. Assoc.*, 65 (1915), No. 22, p. 1954).—The author's investigations have led to the conclusion that intestinal parasites act on the organism through the production of toxins which result in congestion and degeneration of tissues, loss of resisting powers of the red corpuscles, intense anemia, and eosinophilia. The nervous disturbances and even the eosinophilia may be regarded as phenomena of anaphylaxis.

The morphology of the adults of the filaria found in the Philippine Islands, E. L. WALKER (*Philippine Jour. Sci., Sect. B*, 9 (1914), No. 6, pp. 483-491, pl. 1).—The author finds that the Philippine filaria is apparently identical with *Filaria bancrofti*.

Investigations of the development of the free living generations of lung-worms, COUNTESS VON LINDEN and L. ZENNECK (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 76 (1915), No. 2-3, pp. 147-178, pls. 4).—Studies of several species of *Strongylus* are reported upon.

African coast fever, L. E. W. BEVAN (*Rhodesia Agr. Jour.*, 12 (1915), No. 4, pp. 468-483, pls. 7, figs. 5).—A summarized account of the disease, with directions for dipping.

Anthrax, R. DE CASTRO Y RAMIREZ (*Estac. Expt. Agron. Cuba Bol.* 25 (1915), pp. 22, pls. 4, fig. 1).—A general account of this disease and its treatment.

Vaccination experiments against anthrax, A. EICHHORN (*Jour. Amer. Vet. Med. Assoc.*, 48 (1916), No. 6, pp. 669-687).—Substantially noted from another source (*E. S. R.*, 34, p. 579).

Investigations of foot-and-mouth disease, E. KALLERT (*Arb. K. Gsndhtsam.*, 47 (1914), No. 4, pp. 591-613, pls. 4; 48 (1915), No. 3, pp. 351-380, pls. 2).—Several papers are presented which deal with the subject as follows: (1) Importance of the von Betegh Bodies Found in Lymph of Affected Animals (pp.

591-602); (2) Contribution to the Histogenesis and Histology of the Vesicles, Particularly as Relates to the Question of the Occurrence of Inclusion Bodies in the Affected Parts (pp. 603-613); and (3) The Morphology and Biology of the Cytoryctes Cocci Reported by Siegel to be the Cause of Foot-and-Mouth Disease (pp. 351-380).

Concerning the filterability of trypanosomes, S. B. WOLBACH, W. H. CHAPMAN, and H. W. STEVENS (*Jour. Med. Research*, 33 (1915), No. 1, pp. 107-117).—The authors conclude that trypanosomes from cultures and from animal tissues are not filterable through bacteria-proof filters.

The effect of daylight and drying on the human and bovine types of tubercle bacilli, L. FINDLAY and W. B. M. MARTIN (*Vet. Rec.*, 28 (1915), No. 1430, pp. 253, 254).—From experimental evidence the authors have demonstrated that there is little appreciable loss of virulence of either type of the tubercle bacillus after seven days desiccation. Diffused daylight causes a definite lowering of the virulence in both types, the human type being avirulent within seven days. Under the combined influence of desiccation and diffused daylight there is a marked fall in virulence. This fall is more pronounced in the bovine than in the human type.

In general it is concluded that the bovine type is distinctly more susceptible to the effect of ordinary atmospheric influences than is the human type. Such difference may explain in part why aerial infection with the bovine type is so infrequent in the human organism.

The intracutaneous tuberculation of chickens, J. F. H. L. VAN LEEUWEN (*Centbl. Bakt. [etc.], 1. Abt., Orig.*, 76 (1915), No. 4, pp. 275-288).—From the investigation it is concluded that the intracutaneous tuberculation yields fairly reliable results in the diagnosis of tuberculosis in chickens. The turgescence which occurs after the injection is of no significance in the diagnosis, but in judging a reaction the general state of nutrition of the animal must be taken into consideration. If it is desired to reinject, the usual intermission of several weeks is not necessary as the injections may be given during or shortly after the reaction. Local anaphylaxis following a previous injection does not occur in healthy chickens. In making the test it is necessary to use avian tuberculin.

A bibliography of 21 references is appended.

The success and failure of the tuberculin test in certified dairies, C. L. ROADHOUSE (*Jour. Amer. Vet. Med. Assoc.*, 48 (1916), No. 4, pp. 420-429).—Methods of scientific supervision in certified dairies which have given satisfactory results are outlined, and experimental results obtained from the subcutaneous and intradermal tuberculin tests are submitted. It is indicated that "the intradermal test is somewhat more searching in its diagnosis of incipient cases of tuberculosis in animals than the subcutaneous."

The diagnosis of infectious abortion in cattle by means of the Abderhalden dialysis procedure, K. KATZ (*Wiener Tierärztl. Monatsschr.*, 2 (1915), No. 4, pp. 161-172).—The results of the author's investigation have demonstrated that the serum of animals naturally or artificially infected with *Bacillus abortus* is capable of cleaving the protein of abortion bacilli. Normal serum does not possess this property. The dialysis procedure is, therefore, specific in infectious abortion in cattle and is valuable as a diagnostic method, the results being in almost perfect accord with those obtained by the agglutination reaction. The number of failures is no greater than the usual experimental error due to faulty technique.

The special preparation of the antigen, or substrate, is described in detail, and the experimental data are presented in tabular form. A bibliography of 34 references is appended.

A further contribution on the biology of *Hypoderma lineatum* and *H. bovis*, S. HADWEN (*Parasitology*, 7 (1915), No. 4, pp. 331-333, pls. 2).—Substantially noted from another source (*E. S. R.*, 33, p. 775).

**Trichinosis.**—Report of a case with the trichina larvæ in the spinal fluid, L. BLOCH (*Jour. Amer. Med. Assoc.*, 65 (1915), No. 25, pp. 2140, 2141, fig. 1).—This is a report of a case in which trichina larvæ were found in the cerebrospinal fluid. "Meningeal irritation undoubtedly exists, as is shown by the positive Nonne and Noguchi tests. Severe infections show low eosinophil count during the acute stage, which increases with convalescence."

**Salvarsan treatment of infectious catarrh of the upper respiratory tract of the horse**, BARTHEL (*Ztschr. Veterinärk.*, 27 (1915), No. 3, pp. 65-68; *abs. in Vet. Rec.*, 28 (1915), No. 1423, pp. 167, 168).—The author reports that successful results have followed the administration of 4.5 gm. of neosalvarsan dissolved in 100 cc. of distilled water and injected intravenously, the injections varying from one to five days after the first appearance of symptoms of the disease. Fifteen horses were thus treated and four slightly infected cases left for controls. The symptoms of the disease were very characteristic, so that it was possible to exclude strangles and equine infectious pneumonia from the diagnosis. The fever diminished in from 12 to 90 hours after injection and an improvement of the general condition appeared. The controls continued to have irregularities of temperature, pulse, and respiration for some time.

**I. Some further studies of chick mortality**, B. F. KAUF (North Carolina Sta. Bul. 235 (1916), pp. 3-11, 15).—These pages discuss the causes of chick mortality, and report experiments undertaken to determine the effect of feeding various kinds of sour milk and buttermilk in reducing this mortality. All of the lots were raised on ground infected by *Bacterium pullorum*.

In addition to a grain mixture four lots of chicks received the following feeds: Lot 1, sour milk (clabber); lot 2, artificial buttermilk made by *Bacillus vulgaricus*; lot 3, buttermilk made from *B. acidi lactici*; and lot 4, a control lot, no milk. Diarrhea attacked the flocks, resulting at the end of the 8-week period in a 16 per cent loss in lot 1, 10 per cent in lot 2, and 12 per cent in lot 3. In lot 4 diarrhea claimed a toll of 24 per cent during the first four weeks and left the remainder of the flock in such a wrecked condition, constitutionally, that by the end of eight weeks 36 per cent had died.

In individual records of 8 White Leghorns 4 were infected with diarrhea and, although they survived at the end of eight weeks, they averaged only 0.56 lb. in weight, while those that were not attacked averaged 0.74 lb. Eleven birds were attacked by diarrhea and at the end of eight weeks averaged only 0.28 lb. each in weight, while 8 birds which were not affected by diarrhea averaged 0.47 lb. each in weight.

It is concluded that normal, artificial buttermilk, and sour milk are beneficial in baby chick feeding, serving to ward off severe attacks of diarrhea and resulting in greater gains in the chicks. The feeding of sour milk is recommended to begin as soon as the chick is taken from the incubator or nest.

**The diseases of poultry**, J. EHRHARDT (*Die Krankheiten des Hausgeflügels*. Aarau: Emil Witz, 1914, 3. ed., pp. VII+69).—A third edition of this small handbook.

## RURAL ENGINEERING.

**Flow through weir notches with thin edges and full contractions**, V. M. COXE (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 23, pp. 1051-1113, pl. 1, figs. 24).—Laboratory equipment and methods used are described and experiments conducted under a cooperative agreement between the Office of Experiment Stations of this Department and the Colorado Experiment Station on

notches with thin edges and full contractions to determine the accuracy of the Francis and Cipolletti formulas for notches of the sizes ordinarily used in irrigation practice are reported.

It was found that "the discharges through rectangular and Cipolletti notches when plotted logarithmically do not give straight lines and therefore can not be represented correctly by a formula of the type  $Q=CLH^n$ ". It was found, however, in the case of the rectangular notches experimented with and the heads of water run, that a straight-line formula could be deduced that within the range of the experiments gave values quite close to the experimental data.

"The formula

$$Q=3.247LH^{1.48}-\left(\frac{0.568L^{1.8}}{1+2L^{1.8}}\right)H^{1.9}$$

gives discharge values for 1-, 1.5-, 2-, 3-, and 4-ft. rectangular notches that agree within a maximum of approximately 1.2 per cent and within an average of 0.28 per cent with the curves plotted from the experimental data. The discharges throughout the 0.5-ft. rectangular notch do not follow the same law as those for the longer notches. The formula

$$Q=1.593H^{1.526}\left(1+\frac{1}{800H^{2.3}}\right)$$

gives values consistent with the curve plotted from the experimental data.

"The Francis formula gives values within approximately 2 per cent of the actual discharges, so long as the head does not exceed one-third the length of the notch. Within the limits of the experiments the formula

$$Q=3.08L^{1.022}H^{(1.46+0.003L)}$$

gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. rectangular notches that agree within a maximum of 0.7 per cent, and an average of 0.23 per cent, with the values given in the curves plotted from the experimental data. The formula  $Q=1.568H^{1.526}$  gives values for the 0.5-ft. rectangular notch that agree within 1 per cent with the curves plotted from the experimental data. The curve-line formula for rectangular notches takes account of the law of variation of the discharge curves better than does the straight-line formula and, consequently, it appears that it will give closer values for higher heads and longer notches than those experimented with.

"The formula

$$Q=3.247LH^{1.48}-\left(\frac{0.568L^{1.8}}{1+2L^{1.8}}\right)H^{1.9}+0.609H^{2.5}$$

gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. Cipolletti notches that agree within 0.5 per cent with the curves plotted from the experimental data, except in the case of the lower heads on the 1-ft. notch, where the maximum divergence is approximately 1.5 per cent. The discharges through the 0.5-ft. Cipolletti notch do not follow the same law as those for longer notches. The formula

$$Q=1.593H^{1.526}\left(1+\frac{1}{800H^{2.3}}\right)+0.587H^{2.53}$$

represents the discharges through such a notch.

"The Cipolletti formula gives discharge values within 1.5 per cent of the actual discharges so long as the head does not exceed one-third the length of the crest of the notch. The formula

$$Q=3.08L^{1.022}H^{(1.46+0.003L)}+0.6H^{2.5},$$

which is based on the straight-line formula for rectangular notches, gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. Cipolletti notches that agree within a maximum of 1 per cent with the curves plotted from the experimental data, the divergences at all but a few points being 0.5 per cent or less. The formula for the 0.5-foot notch is  $Q=1.566H^{2.864}+0.56H^{2.85}$ . The Cipolletti type of notch does not give discharges as nearly proportional to the length of crest as does the rectangular type, consequently, . . . the rectangular-notch weir is to be preferred.

"The general formula for discharges through triangular notches of from  $28^{\circ}$  4' to  $90^{\circ}$ , and probably up to  $109^{\circ}$ , is

$$Q=(0.025+2.462 S)H^{\left(2.5-\frac{0.0195}{S0.75}\right)}$$

where  $H$  is the head in feet and  $S$  the slope of the sides. Triangular notches having side slopes greater than about 1:4 ( $109^{\circ}$ ) are impractical, as the nappe adheres. The  $90^{\circ}$  triangular notch is the most practical triangular notch and should be used in preference to either rectangular or Cipolletti notches for discharges up to approximately 3 cu. ft. per second. The approximate formula  $Q=2.49H^{2.48}$  will give discharge values for  $90^{\circ}$  notches which agree very closely with the value obtained with the general formula for triangular notches.

"The crest and sides of a weir notch need not be knife-edged. They are sufficiently sharp if the upstream corner of the edges is a distinct angle of  $90^{\circ}$  or less and the thickness of the edges is not so great that the water will adhere to them. The head should be measured upstream from the weir a distance of at least  $4H$ , or sidewise from the end of the crest in the plane of weir a distance of at least  $2H$ .

"The distances required for full contractions with rectangular and Cipolletti notches are approximately  $2H$ , but an additional cross-sectional area of the weir box is required to reduce the velocity of approach.

"With end contractions equal to  $2H$  and a bottom contraction equal to  $3H$ , or end contractions equal to  $3H$  and a bottom contraction equal to  $2H$ , the mean velocities of approach are about  $\frac{1}{2}$  ft. per second, and the discharges with medium to high heads do not agree more closely than approximately 1 per cent with the discharges computed by the formulas. The average ratio of the cross-sectional area of the weir box to the cross-sectional area of the notch required to give discharges within 1 per cent of the values obtained with the formula is greater than 7 and is probably near 15.

"In order to make the results comparable with those for rectangular notches, the end contractions for trapezoidal notches should be measured from about the middle point of the side of the notch, rather than from the end of the crest. A notch which would give discharges proportional to the lengths of the notches would probably have curved sides, the slope decreasing with the head.

"For all practical purposes, discharges through rectangular and Cipolletti notches are not affected until the notch is submerged to a depth equal to one-tenth the head upstream from the weir. Submergence equal to one-eighth the head upstream from the notch decreases the discharge approximately 2 per cent, that equal to one-fourth approximately 6 per cent, and that equal to one-third approximately 9 per cent."

Notes on the duty of water, J. W. BEARDSLEY (*Cornell Civ. Engin.*, 24 (1916), No. 4, pp. 153-160, figs. 2).—It is the purpose of this paper "to indicate some of the questions arising in a determination of the area to be developed under a given water supply, with special reference to conditions existing along the relatively dry coastal plains on the south side of Porto Rico. . . .

● The duty of water for the Porto Rico Irrigation Service, as defined by law, is '4 acre-feet per acre per annum, the said standard to be applied on the basis of fair average years.' Irrigation is carried on continuously throughout the year. The crop is practically entirely sugar cane and it is planted during both spring and fall months."

From experiments from various sources and general conditions in Porto Rico, a curve is given showing "that the value of water in percentage of yield rapidly decreases as a maximum crop is approached, and unless water is very cheap its use beyond that point will not be financially profitable. Up to about 85 per cent its use is of maximum value, thence up to 100 per cent of minimum value to the crop. . . . As the maximum tonnage is passed, the percentage of sucrose in the cane decreases more rapidly than the tonnage of yield on account of the harmful effect of surplus water and oversaturation of the soil. Also between 30 and 80 per cent yields an increase per annum of 1 in. of beneficial water gives 1.8 per cent increase in yield."

Other climatic and hydrographic data are reported "to illustrate the danger of using [such] data covering short periods of time as fair bases for technical problems and the construction of expensive structures."

**The use of mud-laden water in drilling wells,** I. N. KNAPP (*Trans. Amer. Inst. Mining Engin.*, 51 (1916), pp. 571-586, figs. 2).—The object of this paper "is to describe the mixing, testing, and use of mud-laden water for rotary drilling in such a way as to make them helpful to the driller, the operator, or the engineer in solving his own special drilling problems. The structures, apparatus, and tools used are indicated in a general way. . . .

"The information is the result of actual experience in drilling in Coastal Plain formations. The materials encountered in the wells drilled were unconsolidated sands, gravels, and clays, in which thin layers of sandstones, shell conglomerates, and shales began to appear at about 1,200 ft. in depth."

**Irrigation in Netherlands East India** (*Netherlands East Indian San Francisco Com., Dept. Agr., Indus., and Com., Essay No. 12* (1914), pp. 72, pls. 5, figs. 10).—This pamphlet describes the climate, rainfall, and surface water supplies of Java and the distribution and extent of the rice fields of Java and Madocra, discusses the cultivation of crops needing irrigation, and sketches the history and development of irrigation in the Dutch East Indies. Brief descriptions of some of the chief irrigation works are also included. Other topics dealt with are drainage and flood protection; harmful influence of active volcanoes on irrigation works; reservoirs for irrigation purposes; development of the water management, cost of management and maintenance; expenditure and staff for irrigation purposes; results obtained from irrigation works; and irrigation in the possessions beyond Java and Madocra.

**Surface water supply of north Pacific drainage basins, 1912,** N. C. GROVES, F. F. HENSHAW, G. C. BALDWIN, and W. A. LAMB (*U. S. Geol. Survey, Water-Supply Paper 332* (1916), pp. XI+748, pls. 2).—This report combines the material covered by Parts A-C, previously noted (*E. S. R.*, 32, p. 587; 33, pp. 484, 880).

**Water powers of the Cascade Range.—III, Yakima River basin,** G. L. PARKER and F. B. STOEY (*U. S. Geol. Survey, Water-Supply Paper 369* (1916), pp. 169, pls. 20, figs. 12).—This report, prepared in cooperation with the Washington Geological Survey, is based on data consisting of stream-flow records, river plans and profiles, reservoir surveys, and field reconnaissances of streams in the Yakima River basin, an area of about 5,970 square miles slightly south-east of the geographic center of Washington, continuing previous work (*E. S. R.*, 24, p. 313; 29, p. 84).

**The regulation of rivers**, J. L. VAN ORNUM (*New York and London: McGraw-Hill Book Co., 1914, pp. X+393, pls. 6, figs. 96; rev. in Engin. News, 74 (1915), No. 25, p. 1170*).—This book considers the principles underlying the regulation of rivers. It contains chapters on commercial considerations, general phenomena, investigations, surveys, etc., methods of river improvement, the principles of regulation, works of channel contraction, the protection of erodible banks, dredging, levees, and the control of the current.

**Proceedings of the eleventh annual meeting of the Iowa State Drainage Association** (*Proc. Iowa State Drainage Assoc., 11 (1915), pp. 111, figs. 5*).—The following special articles are included in these proceedings:

Platting and Recording Tile Drainage Systems, by C. B. Platt; Soil Erosion, by B. Brooks; Planning and Building Farm Drainage Systems, by F. O. Nelson; Draining and Farm Units, by J. M. Wells; Drainage by Wells, by J. T. Stewart; Soil Moisture—Under Drainage and Crop Production, by W. J. Schlick; Drainage Improvements and Their Relation to Sanitary Conditions, by L. Higgins; Some Sanitary Benefits Resulting from Drainage, by W. Grant; Problems of Drainage Contractor, by H. B. Whitney; Legal Problems in Operating Under the Iowa Drainage Law, by T. P. Harrington; The National Aspect of Drainage, by E. T. Perkins; Levying Drainage Assessments, by G. R. Campbell; and Methods of Paying Drainage Engineers for Their Services, by A. G. Baker.

**Proceedings of seventh annual drainage convention of the North Carolina Drainage Association, 1914**, compiled by J. H. PRATT and Miss H. M. BERRY (*N. C. Geol. and Econ. Survey, Econ. Paper 41 (1915), pp. 70, figs. 3*).—These proceedings contain the following special articles:

The Upbuilding of Eastern Carolina Through Drainage and the Resulting Benefits to the Railroads, by B. E. Rice; Tile Drainage, by W. E. Sherwin; The Importance of Principles of Farm Drainage, by H. M. Lynde; The Drainage and Development of North Carolina's Muck Lands, by C. W. Mengel; North Carolina Drainage Law and Some Needed Amendments, by J. H. Small; and Some New Factors in Drainage Work in North Carolina, by L. Brett.

**The hydraulic ram**, R. B. ROBB (*Cornell Countryman, 13 (1916), No. 4, pp. 275-281, figs. 7*).—The construction and operation of single- and double-acting hydraulic rams are illustrated and described, and the results of performance tests of a typical ram operating under fixed heads, but with varying lengths of stroke of the dash valve, are graphically reported. The mathematical theory of the operation of the hydraulic ram is also briefly presented.

**Electrically driven dragline scrapers dig 45-mile irrigation canal** (*Engin. Rec., 73 (1916), No. 5, pp. 147, 148, figs. 3*).—Data on unit costs of excavating 1,500,000 cu. yds. of material in two seasons with two machines on the Sun River project of the U. S. Reclamation Service are given.

**A comparison between bleach and liquid chlorin disinfection**, C. R. AVERY (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 142-143*).—Experiments are reported comparing bleaching powder and liquid chlorin for the disinfection of water.

The results are taken to indicate that "taking the results as a whole the advantage of what difference there is seems to lie with the bleach. This difference is small, however, and the conclusion is that if a normal water supply be treated with the same amount of available chlorin, whether from bleaching powder or liquid chlorin, and provided proper mixing takes place, the disinfection in either case will be the same."

**Does alum inhibit the action of chlorin as a disinfectant?** C. R. AVERY and O. G. LYE (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 150-155*).—Experiments on the effect of alum on the action of chlorin as a disinfectant for water are reported.

The results are taken to indicate that while the addition of alum immediately causes a considerable reduction in the available chlorine content the disinfecting qualities of the bleach are not apparently affected under a period of 12 hours. The addition of alum to bleach solutions did not have the effect of lowering the bacteriological efficiency appreciably along with the reduction of available chlorine during the first 12 hours; but after this period a perceptible change in efficiency was evidenced.

"The addition of varying amounts of alum does not cause results corresponding to the amounts added. . . . The amount of chlorine in parts per million appears to be reduced in direct proportion to the amount of alum added up to a certain limit, after which the further addition of alum has little effect on the available chlorine."

*American sewerage practice*, L. METCALF and H. P. EDDY (*New York and London: McGraw-Hill Book Co., 1914, vol. 1, pp. X+747, pls. 25, figs. 213; 1915, vols. 2, pp. X+564, pls. 18, figs. 163; 3, pp. XIII+851, pl. 1, figs. 229; vol. 3 rev. in Engin. News, 74 (1915), No. 25, pp. 1168, 1169*).—This treatise deals, in three volumes, with the design and construction of sewers and with sewage disposal.

The chapters of volume 1, *Design of Sewers*, are as follows: The lessons taught by early sewerage works; the general arrangement of sewerage systems; flow of water in pipes and channels; velocities and grades; measurement of flowing water; quantity of sewage; precipitation; formulas for estimating storm-water flow; the rational method of estimating storm-water run-off in sewer design; gaging storm-water flow in sewers; sewer pipe; the design of masonry sewers; examples of sewer sections and the loads on sewers; the analysis of masonry arches; street inlets, catch basins, and manholes; junctions, siphons, bridges, and flushing devices; regulators, overflows, outlets, tide gates, and ventilation; and sewage pumping stations.

Volume 2 deals with the construction of sewers, as follows: Preliminary investigations; engineering work and inspection during construction; excavation; machinery for trench excavation; methods of rock excavation; explosives and blasting; quantity and cost of excavation; rate of progress in building sewers; the sheeting and bracing of trenches and tunnels; sizes of sheeting, rangers, and braces; purchasing, handling, and laying sewer pipe; jointing sewer pipe; construction of brick and block sewers; construction of concrete sewers; profiles, templates, forms, and centers; contracts, specifications, and drawings; technical specifications; operation and maintenance of sewerage systems; and explosions in sewers.

The chapters of volume 3, *Disposal of Sewage*, are as follows: Introduction—progressive steps in sewage treatment; meaning of chemical analyses; bacteria and their relation to the problem of sewage disposal; plankton; composition of sewage; theories of sewage disposal and treatment; sewage disposal by dilution; grit chambers; racks, cages, and screens; sedimentation, straining, and aeration; tanks for sludge digestion; chemical precipitation; sludge; contact beds; trickling filters; intermittent sand filtration; irrigation and the agricultural utilization of sewage and sludge; automatic apparatus for dosing; disinfection of sewage and sewage effluents; and disposal of residential and institutional sewage.

With reference to sewage irrigation and the use of sewage and sludge for fertilization, experience in this country and in Europe is reviewed and it is stated that "the popular opinion of the value of sewage in agriculture is much exaggerated. The fertilizing value of sewage is far less than is commonly supposed, on account of the great dilution of the constituents serviceable to plant life, nitrogen, phosphates, and potash, and, further, because only a part of these substances is present in the sewage in a form suitable for fertilizing pur-

poses. . . . Nitrification is checked if sewage is turned over land in too great quantities or if the air is cold, and if the sewage is applied freely there is a tendency to wash out of the soil what nitrates have formed. In considering the fertilizing value of sewage it is also necessary to consider its ingredients which are detrimental to agriculture. The fat and soap may work harm by clogging the pores of the soil and thus counterbalance the small improvement due to the nitrogen, phosphoric acid, and potash. . . . In sewage disposal . . . the crops should be regarded as merely a by-product. All evidence furnished by many years' experience in many countries under many conditions does not reveal, however, any decisive proof that it is possible to obtain much fertilizing value from city sewage as it must be used to make irrigation practicable, but indicates that where sewage irrigation has been successful agriculturally, irrigation with water would have produced about the same results. English experience indicates that whatever profit is to be made in the future from the fertilizing ingredients of sewage will probably result from the production of artificial manures from sludge."

In a chapter on the disposal of residential and farm sewage, it is stated that "where the desired degree of purification of the sewage is high and the treatment involves methods of filtration which should proceed at fairly regular rates, it is evident that the storage of sewage so as to permit fairly uniform delivery to the filters and some uniformity in the composition of the applied liquid by mixing the laundry wastes, kitchen wastes, and domestic sewage together becomes particularly important. In the second place, the small size of the plants makes it desirable to have them as nearly fool-proof and automatic as possible. Even if the owner's means render economy in management unnecessary, the importance of automatic operation is great because experience shows that regular attendance is rarely given to these little plants."

**Septic tanks and absorption systems**, T. D. BECKWITH and T. A. H. TEETER (*Oreg. Agr. Col. Ext. Div., Ser. 2, No. 8, pp. 18, figs. 9*).—This publication deals with the design and construction of small sewage disposal systems, consisting essentially of a septic tank and tile absorption area. The designs are based on the views of both the engineer and bacteriologist.

It is pointed out that "the septic tank, if made water-tight, can be located anywhere outside the cellar wall without danger of disease or bad odors. . . . The sewer from the house should consist of a 4- to 6-in. vitrified sewer pipe with a trap near the house end to form a water seal in order to guard against the escape of sewer gas into the house." The necessity of compartments in a septic tank is emphasized, and it is stated that "the scum which forms on the surface of the sewage in the first chamber is essential to the proper action of the tank."

Statements regarding other points of controversy among authorities are made as follows: "The tank becomes nothing more nor less than a large culture chamber for the growth of the proper kinds of bacteria, and upon them solely depends the work of purification of sewage entering the tank. . . . The types of bacteria in a septic tank are two, (1) those which thrive without the presence of free oxygen or air and which demand that the portion of the tank in which they grow must be as nearly air-tight as practicable, and (2) those which require oxygen to thrive and which do their work best in the presence of as much air as possible. The second compartment, where the bacterial action is completed, should be so constructed that air may have free entrance and circulation. . . . A septic tank which purifies over 70 per cent is very exceptional, and generally only from 60 to 85 per cent purification may be expected."

**Sewage treatment in small communities where a sewerage system is not available**, P. HANSEN (*Ill. Health News*, n. ser., 1 (1915), No. 11, pp. 179-184, figs. 5).—This article describes and diagrammatically illustrates a type of common settling tank, a small Emscher double-deck or two-chamber tank, and a tile absorption system for the disposal of residential or farm sewage.

"No part of a subsurface drainage system should be within 200 ft. of any well, assuming an ordinary gravelly or sandy soil. If limestone is near the surface, the danger to wells is infinitely increased. However, the subsurface irrigation system is of far less danger to wells than is the ordinary leaching cesspool. This device is an abomination that should not be permitted in any built-up community, for it is almost impracticable to keep them at a safe distance from shallow wells."

**Economy of deep percolating filters**, H. W. CLARK (*Surveyor*, 48 (1915), No. 1245, pp. 540, 541, figs. 2).—Recent experiments made at the Lawrence, Mass., experiment station on the efficiency of four trickling filters 4, 6, 8, and 10 ft. deep, respectively, are reported, each filter being operated at rates of 500,000, 800,000, 1,000,000, 1,500,000, and 2,500,000 gal. per acre per day. Salt was added to the sewage as an indicator of the filter activity.

With the 1,000,000-gal. flow rate "50 per cent of the sewage applied to the 4-ft. filter reaches the filter outlet mingled with 50 per cent of the held sewage 12 minutes after its application, while with the 10-ft. filter 125 minutes elapse before 50 per cent of the applied salt sewage reached the filter outlet mingled with 50 per cent of the held sewage." With the other rates of flow "the applied and held sewage were about equally intermingled and hence were about equal periods of time in passing through each filter."

These results are taken to indicate the great economy of deep trickling filters as compared with shallow trickling filters.

**The oxidation of sewage without the aid of filters**, II, E. ARBERN and W. T. LOCKETT (*Jour. Soc. Chem. Indus.*, 33 (1914), No. 23, pp. 1122-1124).—A continuation on a larger scale of the experiments previously reported (*E. S. R.*, 32, p. 387), using the continuous flow and fill and draw methods, is reported.

"The effluents obtained throughout this series of experiments were extremely well clarified and in general were superior to those yielded by the best type of bacterial filters. The outstanding feature of these results is the fact that by employing diffused air the necessity for intermediate aeration and consequent manipulation of sludge was entirely removed and at the same time much better effluents were obtained than those yielded by plain pipe aeration when working with a similar aeration period.

The effluents obtained in the earlier laboratory experiments, when working with a six hours' plain pipe aeration period, were liable to absorb an undue proportion of dissolved oxygen. . . . In the series of outdoor experiments . . . the dissolved oxygen absorption of the effluents was remarkably low. This low dissolved oxygen absorption, being coincident with a very low free ammonia content, appears to support the theory previously advanced, that the stage to which nitrification has proceeded is not without influence on the amount of dissolved oxygen absorbed."

**The oxidation of sewage without the aid of filters**, III, E. ARBERN and W. T. LOCKETT (*Jour. Soc. Chem. Indus.*, 34 (1915), No. 18, pp. 937-943, figs. 2; *Surveyor*, 48 (1915), No. 1241, pp. 450-454, figs. 2).—A third contribution to the subject gives the results obtained to date regarding "(1) the initial production of activated sludge; (2) the volume of air essential for the successful working of the purification process; and (3) the most advantageous proportion of activated sludge to employ; together with a description of certain experiments relating to the purification of a dilute domestic sewage."

The results are taken to indicate " (1) that, apart from the use of sludge from percolating filters, the initial production of activated sludge can be facilitated and obtained with considerably less air cost than originally was the case, (2) that under certain controlled conditions the volume of air required may be considerably less than previously estimated, and (3) that there is an economic advantage in employing an increased volume of activated sludge with special reference to the rate of nitrification." It is concluded "that the estimated costs of aeration indicate that the activated sludge method of sewage purification is eminently a practical process."

Experiments to determine the economic possibilities of sludge from Emscher or Travis tanks, A. V. DE LAPORTE (*Ann. Rpt. Prov. Bd. Health Ontario*, 33 (1914), pp. 139-141, fig. 1).—Experiments are reported, the results of which to date are taken to indicate that " (1) the sludge has practically no value as a fertilizer or a fuel, (2) extraction for the recovery of the grease or distillation with superheated steam would not pay, and (3) destructive distillation designed to recover the grease, gas, ammonia, etc., might cover expenses."

Tables facilitate accuracy in timber beam design, R. C. HARDMAN (*Engin. Rec.*, 73 (1916), No. 5, pp. 138, 139).—The errors in the usual practice of timber beam design based on nominal sizes are pointed out, it being stated that deficiencies in sizes of timbers vary from  $\frac{1}{4}$  to  $\frac{1}{2}$  in. Factors to be applied to tables of safe loads and a table of actual sizes, sectional areas, and section moduli for commercial lumber surfaced on one side and one edge are given.

Influence of temperature on the strength of concrete, A. B. McDANIEL (*Univ. Ill. Engin. Expt. Sta. Bul.* 81 (1915), pp. 24, figs. 15; *abs. in Engin. and Contract.*, 44 (1915), No. 21, pp. 405-408, figs. 7).—Experiments on the influence of temperature on the attainment of strength in concrete are reported. These included three groups of tests, namely, 45 6- by 6-in. cylinders, 51 6-in. cubes, and 60 8- by 16-in. cylinders. The concrete was composed of 1 part cement, 2 parts sand, and 4 parts broken stone, by weight, corresponding to 1 part cement, 2.2 parts sand, and 3.6 parts broken stone, by volume. The test specimens were stored in temperatures varying from 28.5 to 95.6° F. The temperature of storage was determined by daily readings of the maximum and minimum thermometers. The following conclusions are considered justifiable:

"Under uniform temperature conditions, there was an increase of strength with age within the limits of the tests. For any temperature the rate of increase decreases with the age of the specimen, and this rate of increase is less correspondingly at the lower temperature conditions. For the specimens tested, under normal hardening temperature conditions of from 60 to 70°, the compressive strength of the concrete subjected to a uniform temperature at the ages of 7, 14, and 21 days may be taken as approximately 50, 75, and 90 per cent of the strength at 28 days, respectively. For lower temperatures the percentage values are less, and for higher temperatures the percentages are higher. The relation between the percentage values at the ages of 7, 14, 21, and 28 days is nearly the same for temperature conditions from 30 to 70°. However, the values for the lower temperatures should be used with caution. Concrete which is maintained at a temperature of from 60 to 70° will at the age of one week have practically double the strength of the same material which is kept at a temperature of from 32 to 40°."

Curves of the results are also presented for convenient use.

Use of water-gas tar and coal tar on concrete subjected to high velocities of water, C. H. PAUL (*Reclam. Rec. [U. S.]*, 7 (1916), No. 1, p. 46; *Engin. and Contract.*, 45 (1916), No. 3, p. 56).—The use of water-gas tar and coal tar on the concrete surfaces of the regulating outlets through the Arrowrock dam is

described. These outlets are 4 ft. 4 in. in diameter and are subjected to velocities of 60 ft. per second or higher. The purpose of such surfacing was "not so much that of waterproofing as to fill all the minute voids in the surface of the outlets, so as to prevent, if possible, the erosion caused by the formation of vacuum in small voids or pockets."

The results from one year's service tests are taken to indicate "that the use of this tar coating gave thoroughly satisfactory results."

**The use of concrete for protecting wood-stave pipe,** K. A. HERON (*West. Engin.*, 7 (1916), No. 1, pp. 27-29, figs. 4).—This article describes the remodeling of two partially decayed wood-stave pipe lines in Colorado. Repairs were made by covering the pipe with concrete. Cost data are included.

**Methods for the determination of the physical properties of road-building rock,** F. H. JACKSON, JR. (*U. S. Dept. Agr. Bul.* 347 (1916), pp. 27, figs. 12).—This bulletin is a partial revision of Office of Public Roads Bulletin 44 (E. S. R., 27, p. 587). It is limited to a description of methods employed by the Office of Public Roads and Rural Engineering for testing rock for road building, and "is intended to serve as a more or less permanent laboratory manual for those who have occasion to make such tests." It deals with the physical properties of road-building rock and physical tests of road materials, including specific gravity, weight per cubic foot, water absorption, Deval abrasion test, hardness test, toughness test, cementing value test, and compression test. Two appendixes deal with the selection and shipment of samples and laboratory equipment.

**Proceedings of the thirteenth annual meeting of the Ontario Good Roads Association, 1915** (*Proc. Ontario Good Roads Assoc.*, 13 (1915), pp. 291, pls. 3).—These proceedings include the following special papers: Road Construction in New York State, by G. C. Diehl; Wearing Surfaces, by G. W. Tillson; Finance, by S. L. Squire; Road Laws, by B. Michaud; Bridges and Culverts, by L. E. Allen; State Roads of New Jersey, by R. A. Meeker; Road Foundations, by J. Duchastel; Machinery, by F. E. Ellis; Dust Prevention, by W. W. Crosby; Maintenance of Roads, by G. Henry; Road Organization, by G. H. Henry; Road Location, by C. R. Wheelock; Gravel and Stone Roads, by C. Talbot; The Evolution of the Asphalt Pavement in Toronto, by G. Powell; Good Roads and the Contractor, by H. T. Routly; Traffic and Its Relation to Road Construction, Maintenance, and Cost, by W. D. Sohler; Brick Roads and Streets, by E. A. James; Bituminous Construction, by J. Pearson; Concrete Roads and Streets, by H. S. Van Scoyoc; and Creosoted Wood Block Pavements, by A. F. Macallum.

**Annual report on highway improvement, Ontario, 1914** (*Ann. Rpt. Highway Imp. Ontario, 1914*, pp. 110, figs. 36).—This report deals with the following subjects related to highway improvement: Expenditure by counties, model and experimental roads, bituminous roads, operation and care of machinery, cost keeping and accounting, bridges and abutments, types of county roads, broken stone roads, gravel roads, drainage, the geology of road building materials, the testing of stone and gravel, culverts, explosives, and asphaltic deposits.

**Report of the surveyor general for the year 1914,** A. A. SPOWERS (*Ann. Rpt. Dept. Pub. Lands Queensland, 1914*, pp. 84-98, pls. 5).—The activities and expenditures of the Queensland surveyor general's office for 1914 are reported, together with the reports of district surveyors. These include surveys of lands, roads, etc.

**When the boiler needs attention** (*Power Farming*, 25 (1916), No. 1, pp. 42-44, figs. 5).—Methods of repairing boilers of steam tractors are described and illustrated.

**How to install the farm gasoline engine**, G. H. MATHEWSON (*Gas Power*, 13 (1916), No. 8, pp. 10, 12, 14, figs. 5).—Brief hints are given regarding the installation of an engine, special reference being made to the construction of a proper foundation.

**Antifreezing solutions for your engine**, C. P. SHATTUCK (*Gas Power*, 13 (1916), No. 8, pp. 54, 56).—Ways and means of preventing frozen radiators and cracked cylinders are briefly described, and a table showing the combinations and freezing points of calcium chlorid solutions, alcohol, glycerin, and glycerin and alcohol mixtures is given.

**General notes on power farming**, E. R. WIGGINS (*Power Farming*, 25 (1916), No. 1, pp. 18, 19).—Data on operating the cream separator, on gas engine operation and efficiency, and on grinding feed with an engine are briefly presented.

**Directory and specifications of gasoline and oil farm tractors** (*Farm Machinery*, No. 1265 (1916), pp. 40-43).—This is a second directory, said to be complete to date.

**The latest idea in tractor harvesting**, E. L. WATSON (*Gas Power*, 13 (1916), No. 8, pp. 5, 6, fig. 1).—A means devised and used for operating the binder levers from the engine seat consisted of disconnecting the bundle carrier trip rod and attaching it to a foot lever on the engine frame, transferring the binder shifting lever from the seat pipe and the lever for raising and lowering the reel to the stub tongue within easy reach of the operator.

**The daily working capacities of motor plows and formulas for their determination**, THALLMAYER (*Mitt. Deut. Landw. Gesell.*, 30 (1915), No. 52, pp. 791-794).—The results of different tractor plowing tests are reviewed, with special reference to the relation between brake and drawbar horsepower, depth of plowing, actual hours of work, etc.

The following formula for the determination of daily plowing capacity of tractor plows is proposed:  $F=27 \frac{(aZ)(\beta N)}{iW}$ , in which  $F$ =area plowed in hectares,  $Z$ =gross hours of work,  $N$ =brake horsepower of tractor,  $i$ =depth of plowing in centimeters,  $W$ =soil resistance in kilograms per square decimeter, and  $a$  and  $\beta$  are coefficients, the former indicating the relation between gross and net working hours and the latter the relation between brake and drawbar horsepower. The review of test results shows that  $a$  averaged about 0.75 and  $\beta$  about 0.52 for gas tractors, about 0.73 for steam tractors, and about 0.64 for motor plows.

**The practical value of model tests on the plow**, R. BERNSTEIN (*Mitt. Verb. Landw. Masch. Prüfungsanst.*, 9 (1915), No. 1, pp. 9-24, figs. 3).—This is a mathematical and graphical discussion.

**Trial of steam thrashers at Lyallpur**, W. ROBERTS (*Agr. Jour. India*, 10 (1915), No. 3, pp. 285-287, pls. 2).—A comparison of the work of a 30-in. and a 48-in. thrasher in thrashing wheat is said to indicate the marked superiority of the 48-in. machine.

**Using the modern grain separator**, G. F. CONNER (*Power Farming*, 25 (1916), No. 1, pp. 9, 40, 41, figs. 4).—This is a brief description of the mechanical details of the grain separator in its present stage of development.

**Test of a separator for cold milk of a capacity of 220 liters per hour**, A. NACHTWEH (*Mitt. Verb. Landw. Masch. Prüfungsanst.*, 9 (1915), No. 1, pp. 32-43, figs. 3).—A machine for the separation of cream from cold milk is described and diagrammatically illustrated, and tests are reported with milk at temperatures varying from 3 to 15° C. (37.4 to 59° F.).

The main difference between this machine and those for the separation of warm milk is that the cylinder is larger and the size and number of disks

and of inlet and outlet holes are greater. It was found that the separator removed from cold milk all but from 0.12 to 0.18 per cent of the fat and also cleaned the milk. Separation was continued for an hour without obstruction.

**List of farm building plans** (*Mississippi Agr. Col. Ext. Dept. [Circ.], 1916, pp. 11, fig. 1*).—A list of farm building plans furnished by the agricultural engineering department of the Mississippi College to farmers of Mississippi is given.

**Silos**, D. SCOATES (*Mississippi Agr. Col. Ext. Dept. Circ., pp. 7*).—This circular discusses briefly the essential features of silos, especially the wooden and concrete types.

**Refrigeration and its increasing importance for different purposes**, W. AHRENS (*Naturwissenschaften, 3 (1915), No. 37, pp. 477-483, figs. 9*).—A discussion is given of the applicability and use of refrigeration for different purposes, together with a description of refrigerating processes and apparatus and their practical operation.

**Ice on the farm**, W. L. NELSON (*Missouri Bd. Agr. Mo. Bul., 13 (1915), No. 9, pp. 2-19, figs. 9*).—This is a compilation of information regarding ice and farm ice houses, much of which has been drawn from Farmers' Bulletin 623 of this Department (E. S. R., 32, p. 501).

### RURAL ECONOMICS.

**The settlement of public lands in the United States**, B. H. HIBBARD (*Internat. Inst. Agr. [Rome], Internat. Rev. Agr. Econ., 7 (1916), No. 1, pp. 97-117*).—The author treats of the settlement of public lands in the United States beginning with the year 1783.

He states that "one sorry effect of the great liberality of the land policies by which settlement was encouraged, and almost never restrained, was the almost unbelievable rapidity of settlement of the western country. Population and grain production doubled throughout the great grain States in periods of about 20 years, and this at a time in the development when it meant the addition to the farm area of 50,000,000 or 60,000,000 acres of farm land and 6,000,000 or 8,000,000 of people per decade. The result was ruinously low prices and a discouraged and restless farm people. . . .

"At present what is needed is a plan by which the Government may administer the affairs of the land yet in its hands in such a manner as to result in putting it into the hands of people who will use it for production instead of exploitation. Likewise the state governments need land policies both with respect to land which they still possess and land which in private hands is being used with a view to speculative gains to the present owner, resulting in hardship to the man who actually undertakes to turn a portion of it into a farm."

**The nature of demand for agricultural products and some important consequences**, J. G. THOMPSON (*Jour. Polit. Econ., 24 (1916), No. 2, pp. 158-182*).—The author has divided commodities into two classes—elastic and inelastic. He considers that the demand for a commodity is elastic when that commodity is of such a nature that the demand is sensitive to price change or to a change in the purchasing power of the prospective buyer. He has placed agricultural products in the inelastic class, and states that with reference to food supplies as a whole it is very evident that the demand is relatively inelastic.

"With reference to any particular article of food in the consumption of which there is no fixed custom or habit there may be a considerable measure of elasticity of demand because of the possibility of the substitution of one article of food for another. But the consumption of one article of food in place

of another can not materially increase or decrease the amount of food consumed as a whole. A larger demand for one article would mean simply a smaller demand for other articles. . . . With reference to the textile fibers and other agricultural raw materials for the manufacture of articles of dress, there is seen to be a considerable degree of elasticity of demand, due to the character of the demand for the finished products. . . .

"In recent years the inelastic character of the demand for the products now raised on the farm has afforded a bar to expansion in the production of those commodities proportional to the improvements introduced in agriculture, and the consequence of the introduction of these improvements—especially improved agricultural machinery—taken in connection with the indisposition of demand for agricultural products to expand beyond a certain limit, has been to transfer workers by the millions from the farm to the urban centers. The city has gathered to itself, not only manufactures, but many other activities for the products of which demand is of the elastic sort. The city has thus become, as compared with the country, the center of expansion in industry and thus in population."

**The marketing of farm products**, L. D. H. WELD (*New York: The Macmillan Co., 1916, pp. XIV+483, figs. 2*).—The author's thesis is that marketing is a phase of production as defined by the professional economist. He defines production as the creation of utilities, that is, any process that makes a thing more useful, as by molding it into more desirable forms in the factory, by transporting it from one place where it is less needed to another place where it is more needed, or by storing it from one season of the year when it is less needed until another season when it is more needed. He has treated this subject from this point of view under the headings of marketing at country places, methods of sale, functions and organization of wholesale trade, sales by auction, cold storage as a factor in marketing, cost of marketing, transportation as a factor in marketing, prices of farm products, produce exchanges, price quotations, future trading, inspection and grading, city markets and direct marketing by parcel post, cooperative marketing, problems of retailing, and weaknesses, remedies, and governmental activities.

**Car-lot distribution**, J. S. CRUTCHFIELD (*Fruit and Prod. Marketer, 7 (1916), No. 6, pp. 1, 4, 5*).—The author summarizes his conclusions as follows:

"Car-lot marketing and distribution are accomplished most satisfactorily when the distributing organization, be it composed of growers or middlemen, has the confidence of growers, buyers, retailers, and consumers, as well as bankers and railroads. To justify and retain this confidence and cooperation necessitates an honest and intelligent effort to consider and respect the rights and interest of each."

[Purchase and marketing associations in Posen and West Prussia, their systems of organization and development], Z. NIKLEWSKI (*Landw. Jahrb., 47 (1914), No. 5, pp. 719-787*).—The author points out the occasion and motive for the establishment of the association, the organization of the different unions, the amount of business transacted, and the extent of the organization and membership, and appends a brief bibliography.

**Historical sketch of the development of the Central Bureau and Netherlands Agricultural Committee**, C. G. J. A. VAN GENDEREN STORT (*Nederl. Landb. Com., No. 2 (1915), pp. 91-184*).—This article describes the first central bureau organized to purchase commercial fertilizers and its development and reorganization. The different laws relating to the Central Bureau and the Netherlands Agricultural Committee are included.

**Report on the working of the cooperative credit societies in the district of Ajmer-Merwara, 1913-14** (*Rpt. Work. Coop. Credit Soc. Ajmer-Merwara,*

1913-14, pp. 18+31).—This report shows the number of societies, membership, working capital, interest, rate on loans and deposits, and profit and loss. A brief statement relative to the principal problems arising during the year is included.

Report on the working of the cooperative societies in the Central Provinces and Berar, 1914-15 (*Rpt. Work. Coop. Soc. Cent. Prov. and Berar, 1914-15*, pp. 3+12+49).—This report gives the number of societies by types, their membership, capital, rate of interest, receipts and disbursements, and profit and loss.

Report on the working of the cooperative societies in the Punjab, 1915 (*Rpt. Work. Coop. Soc. Punjab, 1915*, pp. 3+3+11, tables 15).—This report gives the number and types of societies, receipts and disbursements, profit and loss, rate of interest, and a brief review of the progress in the organization and supervision of cooperative societies.

How to finance the farmer: Private enterprise, not state aid, M. T. HERICK and R. INGALLS (*Cleveland: Ohio Com. Rural Credits and Coop., 1915*, pp. 58).—The authors discuss the rural credits movement, early methods of stimulating farm mortgages, building and loan associations, landschafts, bond and mortgage companies, and rural cooperative banking.

In calling attention to the difference between the landschafts and the building and loan associations they claim "that the building and loan association serves both investor and borrower members; it finances itself by their savings, avoids the use of its credit, makes its loans in cash, and is purely cooperative. The landschaft, on the other hand, serves only borrowers; it has no need of savings, deposits, or working funds coming from any source, from either members or non-members, since it operates entirely upon credit and makes its loans in debentures, while it is neither an association nor a company; nor is it co-operative, although it imposes mutual liability on members. In spite of these fundamental differences, however, there are points of resemblance; both are thrift institutions and both are protected by a safeguard which prevents them from being encumbered with obligations to outside parties. . . . Nobody joins the landschaft except applicants for loans, and membership ceases upon repayment of the loan; but liability as a member continues for a statutory period, usually two years, after retirement. . . .

"A marked similarity appears between the methods of accumulating the sinking fund in a landschaft and the capital of a building and loan association. Both come entirely from members through obligatory periodic payments made with the effect, if not in the spirit, of thrift; but there the similarity ends, for a landschaft is the creditor, while the building and loan association is the debtor, of members in respect to its funds, with the landschaft holding exactly a converse position in respect to the outside world."

It is also claimed that the agricultural States should be divided into districts for issuing debentures for loans secured by massed mortgages on farm lands and guaranteed by the unlimited, collective liability of the borrowers.

The following legislative steps are considered necessary for the proper organization of rural credit: "An amendment of the National Banking Act so as to permit a national bank that confines its credit facilities to members to be organized as an association of any form without capital stock; An amendment of the banking act of each State so as to permit any kind of bank that confines its credit facilities to members to be organized as an association of any form without capital stock; an enabling and regulatory law by the nation and by each State, legalizing for economic associations whatever is lawful for corporations; a clause in such laws to permit combination among farmers' associations and associational banks, among associations organized for selling

food and household supplies to members, and among associations organized by artisans for buying on their common account the materials needed in their work or for selling their products."

**Rural organization, community, county, division, state,** H. A. MORGAN and H. K. BAYSON (*Col. Agr. Univ. Tenn., Ext. Div. Pub. 10 (1915), pp. 19, pl. 1, fig. 1*).—The authors believe that there should be organized in the local communities, clubs whose membership have a common interest, and that the local organizations should be federated into county, district, and state institutions. Methods of procedure in the organizing of clubs and a model constitution and by-laws are given.

**Country life week, 1915** (*Ohio State Univ. Bul., 20 (1915), No. 6, pp. 79, figs. 22*).—This report contains abstracts of addresses presented at the second country life conference (E. S. R., 33, p. 190), held at the Ohio State University, August 2-6, 1915, including the following: Rural Organization in Ohio, by P. L. Vógt; Church Administration and the Rural Problem, by W. F. Anderson; The Psychology of Religion, by J. H. Snowden; Rural Resources for Church Efficiency, by G. W. Fiske; Progress in a Northwest Ohio Community, by W. E. Grove; Some Country Church Problems in Ohio, by C. M. McConnell; The Place of the Rural Y. M. C. A. Work in Ohio, by T. D. Lanham; Annual Report of the Executive Secretary of the Ohio Rural Life Association, by C. O. Gill; The Grange as a Community Builder, by L. J. Taber; Agricultural Extension, by C. S. Wheeler; The Farm Bureau of County Agent Work, by G. W. Bush; and Causes of Feeble-Mindedness and Treatment of the Feeble-Minded, by E. J. Emerick.

**Rural housing,** W. G. SAVAGE (*London: T. Fisher Unwin, 1915, pp. X+11-297, pls. 16, figs. 5*).—The author gives briefly the historical development of the housing problem in England and Wales and describes how the housing conditions may be improved. A brief review of the laws relating to rural housing and sanitation is included.

He summarizes his conception of the housing problem as follows:

"Existing cottages are wearing or have worn out; economic causes prevent private enterprise erecting more in anything like sufficient and compensatory numbers; the local authorities will not build if loss is likely to fall upon the rates and the powers to make them are ineffective; the State, through the Local Government Board, exhorts and stimulates, but provides no pecuniary help; the problem is being solved in each place in which it arises by the migration to town or colony of some of the best of the agricultural working classes.

"If the shortage of houses is dealt with, the question of dealing with defective houses presents no great administrative difficulty. The remedy for defective houses is simple—it is more houses. If only there are enough houses the defective houses can be closed or made fit."

**Periodic migrations of Irish agricultural laborers,** J. HOOPER (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 6 (1915), No. 12, pp. 105-114*).—The author points out the source of the migratory laborers, their extent, types, character of work performed, wages, and savings.

**Suggestions concerning checking and tabulating farm management survey data** (*U. S. Dept. Agr., Office Sec. Farm Manag. Circ. 1 (1916), pp. 40*).—Assuming that the investigator is familiar with the methods of gathering farm management survey data in the field, this pamphlet is intended as a desk manual to aid in using these data. The subject is treated from the following standpoints: Checking the office sheets, preliminary calculations, principles of tabulation, classification of farms by tenure, and suggested tables. There is a brief discussion under each of these headings, together with a number of illustrative examples.

**Lumber accounting and opening the books in primary grain elevators.** J. R. HUMPHREY and W. H. KERR (*U. S. Dept. Agr., Office Markets and Rural Organ. Doc. 2 (1916), pp. 12*).—This pamphlet describes the forms necessary to supplement the regular grain elevator accounts when the elevator carries on a lumber business as a side issue, and methods of opening and closing the books of grain elevators. Model forms for the lumber accounts are included.

**Some extremes in Ohio soils.** C. E. THORNE (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 77-85, figs. 2; Agr. Student, 22 (1916), No. 5, pp. 313-320*).—In this article are given comparative results obtained on the experimental farms in Clermont and Paulding counties by the use of different combinations of fertilizers and crops. Marked differences were observed, and it is concluded that "it would seem, as a business proposition, the Paulding county farm was a better investment at \$175 per acre than the Clermont county farm at \$50."

**Statistics of Ohio farms.** F. M. LUTTS (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 91-95*).—The author has pointed out some of the errors found in the agricultural statistics gathered by the township assessors. The principal difficulties were due to misinterpretation of the questions and carelessness in taking the original record, as well as in tabulation.

**Monthly crop report** (*U. S. Dept. Agr., Mo. Crop Rpt., 2 (1916), No. 2, pp. 13-20*).—This report gives a summary of farm prices for corresponding months of 1914, 1915, and 1916, the estimated value of important farm products on January 15 and February 1, 1916, with comparisons for earlier years, the range of prices of agricultural products at important markets, a preliminary estimate of the acreage of truck crops in Florida, a revised estimate of the acreage contracted for by canneries of corn, peas, and tomatoes for 1913, 1914, and 1915, brief statements regarding ocean freight rates on wheat, the crops of India for 1915-16, the Census report on beet sugar for 1914, and miscellaneous data. The aggregate crop value for the thirteen principal crops for 1915 is estimated at \$5,345,842,000 and for all crops \$6,788,905,000.

A summary statement is made relative to the diversification of crops in the South. The wheat acreage in the Southern States increased from 3.7 per cent of the total acreage in 1911 to 7.9 per cent in 1915, the oat crop from 4.3 to 7.1, and the hay crop from 3 to 3.6 per cent.

There is also included a special article by S. A. Jones relative to beans and peas. This contains statistical tables showing the uses to which the crop is put, the usual dates of planting and harvesting, and the acreage of the individual kinds compared with the total acreage of all beans and peas in the various States.

**Agricultural statistics of Italy** (*Ann. Statist. Ital., 2. ser., 4 (1914), pp. 155-168*).—This report continues data previously noted (*E. S. R., 32, p. 491*), adding information for 1914.

### AGRICULTURAL EDUCATION.

**The fighting chance for agriculture.** E. B. COLLETT (*Proc. Cent. Assoc. Sci. and Math. Teachers, 14 (1914), pp. 25-28*).—The author endeavors to point out some dangers to agricultural instruction in its effort to gain a place in the educational system. He concludes that while agriculture brings most valuable and practical material to the school, it lacks an organization and richness of content necessary for class-room work; that, in order to render a real service to the educational system, there must be poured into the heart of the course a technique, such as Latin contains, for mental development; that a careful watch must be kept of scientific advancement and at the same time its particular application to the changing needs of agriculture in practice; and that not the course of study but service toward mankind must be made the goal.

"Agriculture, as a school course, had better never be taught if it fosters an aim of specialized competition among men rather than a united effort in directing the forces of nature for the benefit of mankind."

**Vocational training and liberal culture**, C. C. SCHMIDT (*Proc. N. Dak. Ed. Assoc.*, 28 (1914), pp. 180-187).—The author gives the definitions of the term "culture" of a number of leading educational authorities and discusses the cultural value of vocational education, taking agricultural and home economics courses as examples.

**Work for the improvement of rural education**, C. P. COLEGROVE ET AL. (*Bull. Iowa State Teachers Col.*, 15 (1915), No. 3, pp. 83, figs. 116).—This is a report on the work of the Iowa State Teachers College in the improvement of rural education by means of rural demonstration schools; the introduction of agriculture, domestic science, and manual training, which are required subjects in the rural schools of Iowa since July 1, 1915; the organization of community centers; extension work for the improvement of teachers in service, including teacher study centers, county institutes, lectures, and entertainments; and training teachers for rural schools.

**Recommendations and regulations for the establishment, organization, and management of agricultural and household science departments in continuation and high schools and collegiate institutes** (*Toronto, Canada: Ont. Dept. Ed.*, 1915, pp. 45).—The requirements as to accommodations, equipment, qualifications of staffs, and courses of study for the approval of the establishment of an agricultural or household science department, or both, and the distribution of the annual government grant of \$150 for each year of the courses in agriculture and household science, respectively, under the industrial education act, are outlined.

It is provided that the school board must appoint an advisory agricultural committee, consisting of four members of the board and four rate payers actually engaged in agricultural pursuits, and that for a beginning an area for experimental plots of 8 or 10 square rods of land within the school grounds or adjoining them may be found sufficient. The courses at present cover only two years but a third year will be added as soon as required. The agricultural subjects include farm mechanics, science, fruit growing, floriculture, landscape and vegetable gardening, beekeeping, poultry husbandry, field crops, animal husbandry, dairying, farm management, rural economics and arithmetic; and the household science subjects include cleaning, cooking, foods, the house, laundering, sewing, marketing, entertaining, household accounts, home nursing, and emergencies, beekeeping, poultry and dairy husbandry, fruit growing, floriculture, landscape and vegetable gardening, entomology, bacteriology, and rural economics. Lists of suggested home projects in agriculture and household science are included. An outline of a seasonal course in the special agricultural subjects and price lists of equipment for the agricultural and household science departments are appended.

**The best type of agricultural high school**, C. J. N. NELSON (*Proc. N. Dak. Ed. Assoc.*, 28 (1914), pp. 81-84).—This discussion is intended to bring out the relative economy and efficiency of the two types of agricultural high schools in the State of North Dakota, viz, the state schools and the county or Gibbens schools.

The state agricultural high school is a city school receiving \$2,500 annual state aid for agricultural instruction, the agricultural department of which is under local direction and supervision. The county agricultural school is a separate institution with a separate building, faculty, and administration, under the direction of a county board, and receiving \$3,000 annually from the State for maintenance.

The author believes that a maximum of efficiency at a minimum of expense can best be attained when agriculture is put in as a department in a school rather than to make the school exclusive in this line and limiting the work only to prospective farmers. He contends that agriculture should be placed within the reach of all young people, boys or girls, side by side with all other cultural subjects and not segregated from the so-called cultural school. Further, the student in the high school should not begin to specialize except to some extent in agriculture in the higher classes, and should be in a school with broad courses and liberal electives to have full freedom of choice.

**The Gibbens schools, W. A. BROYLES** (*Proc. N. Dak. Ed. Assoc.*, 28 (1914), pp. 77-80).—An account is given of the organization and work of the county agricultural school at Park River, N. Dak., which is one of two such county schools supported jointly by the county and the State under the Gibbens Act of 1911, amended in 1913 (see above).

These schools are free to residents of the county, and teach agriculture, including the study of soils, horticulture, plant life, and animal life, a system of farm accounts, manual training and domestic economy, and the common branches and such other branches as are necessary for the training of teachers in methods of school management and provision for observation and practice in the art of teaching. The schools are a continuation of an ungraded system instead of a graded system and the law does not define or speak of them as high schools.

The advantages of this type of school are summed up as follows: "The county as a unit has more funds than a smaller unit and admits of more systematic extension work than a larger unit. . . . In attacking the question of rural community life in its various phases the county school has the great advantage of a single aim. . . . It has no set of grades to divide the time of the executive. In its rural school work it has the resources of the county superintendent's office with its deputies to share responsibilities and give assistance. It has no assured consistency in the form of a ninth grade coming in regularly with the change of the seasons. This single-mindedness gives it opportunity to concentrate its forces upon certain things—individual instruction and careful classification; an elaborately planned and directed short course, going about the county, learning of it and serving it through schools and families, providing a center for rural life propaganda."

**Eighth annual report of the inspector of high schools to the state board of education for the year ending June 30, 1915, R. HEYWARD** (*Bismarck, N. Dak.: State Ed. Dept., 1915, pp. 53, figs. 9*).—This report includes, among other material, statistical data on the enrollment, equipment, salaries, etc., of the five state high schools having an agricultural department, and brief reports on the school farm at Carrington, the extension work of the schools, and state aid for agricultural instruction.

It is shown that 43 high schools offered courses in agriculture in the past year and that 8.5 per cent of the pupils enrolled pursued the work. The five schools having an agricultural department report a total value of equipment for agricultural instruction of \$2,850, and a total enrollment in agriculture of 133, a gain of 24 over the previous year. The enrollment in agriculture in all of the other state high schools for the year was 307, a gain of 65 over the previous year. Each of the five schools received \$2,020 state aid for its agricultural department.

**What the instruction at the Royal Agricultural, Horticultural, and Forestry High School is and what it should be, Z. KAMERLING** (*Indische Mercur, 38 (1915), Nos. 28, pp. 565-567; 29, pp. 585-587*).—This is a discussion of the curriculum of the Royal Agricultural, Horticultural, and Forestry High

School at Wageningen, The Netherlands, and suggestions for its improvement, by an instructor who was a former student at this school.

**Material and methods for teaching agriculture in the grades below the high school,** C. D. LEWIS (*Proc. Ky. Ed. Assoc.*, 44 (1915), pp. 158-160).—The author does not consider agricultural instruction so much a new branch to be taught in the elementary schools as a new attitude of mind, a new relation to life, which it is hoped to secure through new ideals and ideas gradually instilled into the lives of children through the medium of the old subjects reorganized around a new center. He discusses the reconstruction of the elementary general school subjects to this end, and recommends that agricultural nature study material be added and that the science of agriculture be left for secondary and higher institutions.

**Home projects in secondary courses in agriculture,** H. P. BARROWS (*U. S. Dept. Agr. Bul.* 346 (1916), pp. 20).—With the view of making the home farm a more definite factor in agricultural instruction through the home project plan, the author discusses the development of the home project idea and the essentials of a successful project; outlines potato, pig, alfalfa, orchard, poultry, and farm home projects; suggests lists of production, demonstration, improvement, and management projects; and calls attention to some project problems now receiving attention.

**Physical geography and soils,** R. P. GREEN (*Proc. Ky. Ed. Assoc.*, 44 (1915), pp. 160, 162-167).—This is a consideration of the problem of so teaching physical geography as to increase the pupils' knowledge of the soils, especially as to their origin and nature, the destructive work of mechanical erosion and its relation to soil fertility and permanent agriculture, etc.

**Home economics instruction,** COUNTESS R. DE DIESBACH (*Enseignement ménager. Paris: Pierre Tequi* [1914], pp. XXXII+127).—This is a discussion of the need, nature, organization, choice of teacher and her qualifications, and results of home economics instruction in France.

**Extension course in vegetable foods,** ANNA BARROWS (*U. S. Dept. Agr. Bul.* 123 (1916), pp. 78, figs. 4).—This is a revision of Bulletin 245 of the Office of Experiment Stations, previously noted (*E. S. R.*, 26, p. 597).

**Teaching of sewing,** RUBY BUCKMAN (*Proc. Ky. Ed. Assoc.*, 44 (1915), pp. 96-98).—The author offers suggestions on subject matter and method in teaching sewing, and holds that sewing if properly taught possesses cultural value and numerous other advantages.

**Nature-study in the Geneseo schools, Ill.,** JOSEPHINE BAILEY (*Nature-Study Rev.*, 11 (1915), No. 9, pp. 418-421).—The study of insects, animals, birds and flowers, and weeds and trees in grades 3, 4, and 5 of the Geneseo, Ill., schools is described.

**Intensive gardening,** ELIZABETH P. SHEPPARD (*Nature-Study Rev.*, 11 (1915) No. 3, pp. 424-428, fig. 1).—An outline is given of gardening work as conducted in the spring of 1915 at the normal school at Trenton, N. J. Some 200 children of the practice school worked out garden projects, individually or in groups, and about 100 normal school students from the nature study classes assisted in the activities, learning how to plan and conduct this part of nature study.

**Boys' and girls' club work for 1916,** C. A. NORCROSS (*Agr. Ext., Univ. Ner. Leaflet* 1 (1915), pp. 4).—This circular outlines the organization and procedure for three state-wide boys' and girls' clubs organized in January, 1916, viz, a girls' home economics club and boys' and girls' animal husbandry and gardening clubs. It is proposed to offer 2-year courses in these clubs, those having received an extension certificate for the satisfactory completion of the first-year course being eligible for the second-year advanced work in 1917.

## NOTES.

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**Georgia Station.**—B. W. Hunt, of Eatonton, has been appointed to succeed J. W. McWhorter as a member of the board of directors.

**Kansas College and Station.**—D. E. Lewis, assistant professor of horticulture and assistant in the fruit and vegetable disease investigations, resigned April 1 to engage in commercial fruit growing. P. E. Crabtree, specialist in crops in the extension division, has been appointed district agricultural agent for western Kansas with headquarters at Scott City.

**Maine University.**—Alexander Lurie, instructor in horticulture, has been appointed horticulturist in the Missouri Botanical Garden.

**Cornell University.**—The New York State College of Agriculture, in cooperation with various other state agencies, such as the farm bureaus, is conducting an active campaign this spring against oat smut. In this campaign it is using a pictorial poster in bright colors, the poster showing two men in the act of treating smut with formaldehyde solution, while the lettering on the poster gives very briefly the essential features of the treatment. Information on the subject is being sent out systematically to the agricultural press, largely through the farm bureau agents. One of the railroads of the state is running an oat smut demonstration train.

All of these activities are regarded as preliminary to the most important part of the work, which is actual demonstration through meetings with farmers.

**Pennsylvania Station.**—The station has planned an extensive field test of different carriers of phosphorus. The plan of this experiment calls for 4 tiers of 41 one-tenth acre plats in each, making a total of 164 plats. The crop rotation will consist of corn, oats, wheat, and mixed clover and timothy, each one year, and the fertilizers will not be applied until the plats have passed through one four-year rotation. This will afford preliminary data concerning the relative fertility of the plats.

The experiment is designed to test the relative efficiency of equal amounts of phosphorus in different carriers when used in connection with a complete fertilizer, with barnyard manure, and with a crop rotation in which the crop residues are returned to the soil. It will also include the effect of lime on the different forms of phosphorus, together with a comparison of the different methods of applying rock phosphate and acid phosphate.

During the past summer preliminary field and pot experiments were conducted with soil of the Dekalb series from the vicinity of Snow Shoe, Center County. This has led to the establishment of a field experiment in somewhat greater detail with a view of determining the effect of manure, lime, and commercial fertilizers for the improvement of the Dekalb soils.

**Rhode Island Station.**—Frank O. Flitts has resigned as assistant in chemistry to accept a similar position at the New Jersey stations.

**Vermont University.**—County agents are now at work in 11 of the 14 counties of the State. F. C. Shaw, agricultural instructor in the farm and trades' school at Thompson's Island in Boston Harbor, began work in Bennington County March 27, and F. H. Abbott in Washington County, April 13.

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## INDEX OF NAMES.

- |  |                                   |                                    |
|--|-----------------------------------|------------------------------------|
| Abbe, C., jr., 614.                            | Anderson, A. C., 322.             | Atwood, G. G., 40.                 |
| Abbott, A. C., 192.                            | Anderson, E. M., 651.             | Atwood, H., 689.                   |
| Abbott, F. H., 900.                            | Anderson, G. F., 332, 371.        | Aubel, C. E., 400.                 |
| Abbott, J. B., 699.                            | Anderson, J. F., 56.              | Auld, S. J. M., 352.               |
| Abderhalden, E., 500, 563, 577, 578, 607, 708. | Anderson, F. J., 542.             | Aull, W. B., 199.                  |
| Abrams, D. A., 685.                            | Anderson, V. G., 118.             | Aust, F. A., 98.                   |
| Ackermann, E. R., 782.                         | Anderson, W. F., 895.             | Ansten, E. E., 254.                |
| Acree, S. F., 538.                             | Andouard, P., 372.                | Avary, P. H., 321.                 |
| Adams, F., 282.                                | Andreasch, R., 311.               | Averitt, S. D., 121, 683.          |
| Adams, J. F., 247, 497.                        | Andreeva, N. V., 449.             | Avery, C. R., 885.                 |
| Adie, H., 855.                                 | Andrew, H. W., 532.               | Awall, P. R., 451.                 |
| Adkin, B. W., 743.                             | Andrews, E. A., 236.              | Ayers, E. L., 737.                 |
| Adler, L., 502.                                | Andrus, C. G., 413.               | Ayers, S. H., 165, 571.            |
| At Trolle, R., 574.                            | Angelis d'Ossat, G. de, 221, 786. | Ayuso, R., 100.                    |
| Agee, A., 197.                                 | Angot, A., 415.                   | Azzi, G., 207, 208.                |
| Acree, J. H., 321, 222.                        | Annett, H. E., 38.                |                                    |
| Agulhon, H., 730.                              | Anstead, R. D., 728.              | Babcock, D. C., 448, 543.          |
| Ahern, G. P., 306.                             | Anthony, E. L., 78.               | Babcock, E. B., 236.               |
| Ahrens, W., 592.                               | Anthony, K. D., 234.              | Back, E. A., 59, 554, 655, 758.    |
| Alcher, L. C., 734.                            | Antoine, 498.                     | Bacon, R. F., 166.                 |
| Alkman, C. M., 670.                            | Apostol, S., 631.                 | Baczynska, H., 281.                |
| Almslie, C. N., 751.                           | Appel, O., 48, 442, 541.          | Badeck, L. M., 256.                |
| Ald, J. A., 384.                               | Appiani, H. P., 223.              | Baer, A. C., 859.                  |
| Albert, 588.                                   | Appl, J., 845.                    | Babilman, C., 507.                 |
| Albert, J., 682.                               | Appleman, C. O., 523.             | Bahsen, P. F., 273.                |
| Alberts, G. A., 535.                           | Appleyard, A., 514.               | Rail, O., 377.                     |
| Albright, A. R., 410.                          | Arber, A., 134.                   | Bailey, C. H., 610, 798.           |
| Alciatore, H. F., 118.                         | Archibald, E. S., 663.            | Bailey, E. H. S., 311.             |
| Alderman, W. H., 637.                          | Archila, P., 300.                 | Bailey, E. M., 311.                |
| Aldrich, J. M., 64, 251, 400, 855.             | Aretowski, H., 118, 415.          | Bailey, F. M., 100.                |
| Aldrich, T. B., 608.                           | Ardern, E., 888.                  | Bailey, J., 899.                   |
| Alexander, A. S., 469.                         | Arens, P., 57.                    | Bailey, L. H., 396, 689, 700, 796. |
| Alexander, W. H., 117.                         | Arias, 299.                       | Bailey, M. A., 649.                |
| Blair, R. G., 672.                             | Aries, W. H., 524.                | Bailey, P. G., 74.                 |
| Uard, H. A., 247.                              | Armington, J. H., 615.            | Bailey, V., 449.                   |
| Allen, F. L., 497.                             | Armsby, H. P., 699.               | Bailaud, E., 227.                  |
| Allen, F. W., jr., 342.                        | Armstrong, C. G., 204.            | Bain, J. B., 472.                  |
| Allen, L. E., 800.                             | Armstrong, E. F., 731.            | Baird, R. O., 661.                 |
| Allen, R. M., 166, 761, 767, 775.              | Armstrong, E. H., 28.             | Baker, A. C., 754, 854.            |
| Allen, R. T., 321, 322, 418.                   | Armstrong, H. E., 199.            | Baker, A. G., 885.                 |
| Allen, S. J. M., 615.                          | Arnaud, G., 243.                  | Baker, F. R., 819.                 |
| Allen, W. J., 833.                             | Arnd, T., 18.                     | Baker, G. A., 600.                 |
| Allen, W. M., 661.                             | Arny, A. C., 339.                 | Baker, H. H., 489.                 |
| Allison, F. E., 499.                           | Aron, H., 258.                    | Baker, H. J., 699.                 |
| Allison, I. M. K., 64, 493.                    | Arpin, 256.                       | Baker, H. P., 345.                 |
| Allyn, O. M., 336.                             | Arrhenius, S., 607.               | Baker, J. D., 776.                 |
| Alter, J. C., 413.                             | Arthur, J. C., 736, 744.          | Baker, M. M., 499.                 |
| Altang, H. C., 391.                            | Artis B., 615.                    | Baker, E., 489.                    |
| Alway, F. J., 499, 719.                        | Ascoli, A., 676.                  | Baker, W. H., 97.                  |
| Amerio, A., 413.                               | Asbury, S. F., 348.               | Baker, W. N., 332.                 |
| Ames, J. W., 619, 810.                         | Ashley, W. J., 791.               | Bakke, A. L., 334, 728.            |
| Ammann, L., 590.                               | Ashton, F. W., 214.               | Baldwin, G. C., 884.               |
| Amundsen, E. O., 857.                          | Aston, B. C., 519.                | Baldwin, M., 210, 211, 322, 417.   |
|  | Atherton, L. G., 94.              |                                    |
|  | Atwood, F. G., 274.               |                                    |

- Balfour, F. R. S., 182.  
 Ball, C. R., 39.  
 Ball, E. D., 695.  
 Ball, W., 347.  
 Ballard, E., 549.  
 Ballard, W. S., 352.  
 Ballinger, A. M., 756.  
 Ballou, F. H., 833.  
 Ballou, H. A., 65, 857.  
 Balls, W. L., 645.  
 Bamber, M. K., 48.  
 Bancroft, C. K., 40, 442.  
 Bancroft, R. L., 96.  
 Bancroft, W. F., 157.  
 Bang, L., 808.  
 Bang, O., 575.  
 Banham, G. A., 777.  
 Banks, N., 66, 357, 361, 458, 857.  
 Baragiola, W. I., 43.  
 Barharin, I. E., 842.  
 Barber, C. A., 227.  
 Barber, H. G., 550.  
 Barber, H. S., 364, 557.  
 Barendrecht, H. P., 712.  
 Barfuss, K., 51.  
 Barker, J. F., 35, 725.  
 Barker, P. B., 293.  
 Barnard, E. E., 413.  
 Barnard, H. E., 861.  
 Barneby, O. L., 712.  
 Barnes, W. C., 868.  
 Barnett, C. R., 494.  
 Barnett, W. A., 279.  
 Barr, J. A., 724.  
 Barre, H. W., 613.  
 Barrett, J. T., 352, 353, 354.  
 Barrett-Hamilton, G. E. H., 57.  
 Barrier, A., 576.  
 Barrios, F. A. S., 572.  
 Barrows, A., 899.  
 Barrows, H. P., 899.  
 Barrus, M. F., 644.  
 Bars, H. P., 199, 351.  
 Bartel, C., 77.  
 Barthel, 881.  
 Barthel, C., 499.  
 Bartholomew, F. T., 444.  
 Bartlett, H. H., 224.  
 Barton, W. H., 94.  
 Bartow, E., 67, 520, 591.  
 Bartram, H. E., 538.  
 Bastin, H., 28.  
 Batchelor, L. D., 533, 613, 629.  
 Bates, F. W., 99.  
 Bates, J. S., 240.  
 Bateson, E., 346.  
 Bateson, W., 41, 732.  
 Batres, R. P., 306.  
 Battison, W. J., 668.  
 Batz, M. G., 718.  
 Baudrexel, A., 471.  
 Bauer, L. A., 615.  
 Baumann, F., 163.  
 Bayard, E. S., 28.  
 Bayles, J. L., 695.  
 Baylis, G. de S., 820.  
 Bayliss, W. M., 777.  
 Beach, B. A., 481, 675.  
 Beach, J. R., 274, 784.  
 Beach, S. A., 342.  
 Beadle, C., 227.  
 Beal, A. C., 345.  
 Beal, F. E. L., 59.  
 Beal, G. D., 501.  
 Beal, W. J., 732.  
 Beals, C. L., 467.  
 Beardsley, J. W., 883.  
 Beattie, R. K., 336.  
 Beaulieu, G., 449.  
 Beaunverie, J., 851.  
 Beaven, E. S., 35, 729.  
 Beck, M. W., 120, 322, 418, 511, 717.  
 Beck, W., 287.  
 Becker, 327.  
 Becker, G. G., 653.  
 Beckerich, A., 208.  
 Beckett, S. H., 282.  
 Beckwith, C. S., 158, 161.  
 Beckwith, T. D., 887.  
 Beebe, C. K., 501.  
 Beegle, F. M., 315.  
 Beekman, H., 839.  
 Beger, C., 366, 706.  
 Begg, J. T., 93.  
 Begtrup, E., 258.  
 Behrman, A. S., 609, 683.  
 Beljerinck, M. W., 499.  
 Belle, L., 545.  
 Beltske, H., 678.  
 Belgrave, W. N. C., 648.  
 Belle, J. A., 520.  
 Bell, B., 97.  
 Bell, C. E., 661.  
 Bell, N. E., 119, 321, 322.  
 Bell, R. L., 586.  
 Belleval, G., 489.  
 Belling, J., 431.  
 Benalges, C., 535.  
 Bencomo, C., 757.  
 Benedict, F. G., 260, 663, 764, 861.  
 Benedict, H. M., 222.  
 Bengtson, N. A., 293.  
 Bennett, C. F., 416.  
 Bennett, H. H., 209, 321.  
 Bennett, J. B., 319.  
 Benskin, E., 239, 240.  
 Benson, H. K., 412, 508, 509.  
 Bentley, J., Jr., 741, 742.  
 Bentley, M. C., 794, 861.  
 Bentley, W. H., 72, 501.  
 Berg, W. N., 557.  
 Berger, E. W., 649.  
 Berkhout, A. D., 608.  
 Berlese, A., 456.  
 Herman, L., 801.  
 Bernard, C., 55, 835.  
 Bernard, E., 503.  
 Bernstein, H. S., 563.  
 Bernstein, J. M., 254.  
 Bernstein, R., 891.  
 Berry, E., 662.  
 Berry, H. K., 278.  
 Berry, H. M., 885.  
 Berseau, A., 535.  
 Bertholet, U., 591.  
 Bertoni, G. T., 38.  
 Besley, F. W., 440.  
 Bessey, E. A., 244, 794.  
 Beutenmuller, W., 562.  
 Bevan, L. E. W., 879.  
 Bey, J. B. P., 576.  
 Biederman, C. R., 236.  
 Biermann, 13.  
 Bigelow, E. M., 587.  
 Bigelow, F. H., 414.  
 Bigelow, M. A., 795.  
 Bigelow, S. J., 407.  
 Bigelow, W. D., 12, 636.  
 Bilger, H. E., 86.  
 Billings, G. A., 592.  
 Binford, J. H., 292.  
 Binz, A., 801.  
 Bioletti, F. T., 60, 207, 235, 544, 740.  
 Birge, E. G., 591.  
 Dirk, C., 559.  
 Bishop, E. C., 793.  
 Bishop, E. S., 719.  
 Bishop, H. E., 861.  
 Bishop, F. C., 159, 339, 554.  
 Bitting, A. W., 714.  
 Björlykke, K. O., 16.  
 Blaauw, A. H., 223.  
 Black, C. G., 91.  
 Blacklock, B., 187.  
 Blackman, F. F., 822.  
 Blackmore, E. H., 651.  
 Blackwood, J. R., 567.  
 Blair, A. W., 127, 129, 130, 132, 140, 499, 621, 622, 632.  
 Blair, R. E., 229, 231.  
 Blair, W. R., 117.  
 Blake, M. A., 44, 143, 157, 161, 639.  
 Blanchard, A. H., 484, 586.  
 Blanchard, H. L., 95, 294, 494, 694.  
 Blanck, E., 724.  
 Bland, N., 11.  
 Bland, R., 232.  
 Blatherwick, N. R., 366, 507.  
 Blau, 81.  
 Bleyer, A., 462.  
 Bligh, M. J., 610, 803, 806.  
 Bloch, L., 831.  
 Bloor, W. R., 563, 562, 563.  
 Blosser, R., 258.  
 Blumenthal, P. L., 504.  
 Rodinus, 660.  
 Bodnar, J., 52, 428, 713.  
 Boeger, E. A., 593.

- Boekhout, F. W. J., 590.  
 Doerger, A., 307.  
 Boerker, R. H., 441, 640, 641.  
 Boes, J., 257, 472.  
 Bohle, J., 113.  
 Bois, D., 836, 840.  
 Bois-Reymond, R. du, 281.  
 Bokorny, T., 30, 502, 561.  
 Bolin, P., 519, 865.  
 Bolser, F. A., 273.  
 Bolton, E. K., 709.  
 Boltz, G. E., 202.  
 Bonardi, J. P., 98.  
 Bonazzi, A., 124.  
 Bonequet, P. A., 645, 646.  
 Bond, C. J., 225.  
 Bondar, G., 55.  
 Bonertz, J., 575.  
 Bonine, C. A., 829.  
 Bonnefont, G., 869.  
 Bonnama, A. A., 508.  
 Bonnet, A., 480.  
 Bonchart, C., 767.  
 Borden, A. D., 355.  
 Bornbusch, C. H., 814.  
 Bos, J. R., 62.  
 Bose, J. C., 29.  
 Bosinelli, G., 728.  
 Bosler, J., 414.  
 Bosscha, K. A. R., 835.  
 Bosworth, A. W., 97, 708, 802.  
 Bottomley, W. B., 325, 515.  
 Boucher, A. C., 322.  
 Bouchner, W. C., 137.  
 Bouchton, T. H., 878.  
 Boulenger, C. L., 187.  
 Bourne, A. I., 252.  
 Boussinesq, J., 319.  
 Bouroucos, G. J., 215, 216, 419, 721.  
 Bovie, W. T., 683.  
 Bowditch, J. P., 380.  
 Bowes, O. C., 472.  
 Bowker, W. H., 96, 295, 597.  
 Bowley, R. L., 684.  
 Bowman, F. C., 203.  
 Bowman, M. L., 529.  
 Borce, W. G. H., 48.  
 Bracker, E. M. D., 789.  
 Brackett, R. N., 13, 26, 521.  
 Bradley, F. M., 600.  
 Bradley, H., 425.  
 Bradt, S. E., 391.  
 Brachna, A., 652.  
 Bralim, 376.  
 Branch, G. V., 737.  
 Brand, C. J., 194, 318, 490, 529.  
 Brandt, S. W., 614.  
 Braun, A. F., 64.  
 Braun, J. W., 98.  
 Brauns, D. H., 403.  
 Braunsen, E., 535.  
 Bray, G. E., 393.  
 Breakwell, E., 631.  
 Breckenridge, L. P., 789.  
 Breed, H. E., 484.  
 Breed, R. S., 673.  
 Brehme, H. H., 556.  
 Breidahl, H. G. D., 713.  
 Breteau, P., 410.  
 Brétignière, L., 517.  
 Brett, L., 885.  
 Brewer, L., 164.  
 Bridges, C. B., 500.  
 Briggs, L. J., 34, 226, 306, 522.  
 Brigham, E. S., 690.  
 Brinkley, L. L., 321, 418.  
 Briosi, G., 539.  
 Britten, H., 534.  
 Brittlebank, J. W., 575.  
 Britton, W. E., 363, 400.  
 Brodie, F. J., 14.  
 Bronfenbrenner, J., 674.  
 Brooks, B., 885.  
 Brooks, F. S., 185.  
 Brooks, F. T., 57, 448, 846.  
 Brooks, T. R., 614.  
 Brooks, W. P., 138.  
 Broomell, A. W., 559.  
 Brounov, P. I., 207.  
 Brown, A. J., 626.  
 Brown, C. W., 727, 732, 746.  
 Brown, Edgar, 832.  
 Brown, Edward, 877.  
 Brown, F., 615.  
 Brown, G. A., 561.  
 Brown, H. B., 676, 830.  
 Brown, H. S., 597.  
 Brown, J. G., 430.  
 Brown, L. A., 166.  
 Brown, P. E., 10, 19, 20, 27, 112, 499, 619, 722, 723, 836.  
 Brown, T., 232.  
 Brown, W., 847.  
 Browne, W. W., 208.  
 Brownlee, R. R., 599.  
 Broyles, W. A., 898.  
 Bruce, D., 641.  
 Bruck, W. F., 227.  
 Brues, C. T., 654.  
 Bruin, W., 761.  
 Bruljning, F. F., 344.  
 Bruinsma, A. E. J., 348.  
 Brunner, J., 159.  
 Brunnich, J. C., 760.  
 Bryan, E. A., 97.  
 Bryan, M. K., 442.  
 Bryan, W. E., 198.  
 Bryce, P. I., 54.  
 Bryson, H. K., 895.  
 Bubberman, C., 81.  
 Buchanan, G. B., 484.  
 Buchanan, R. E., 477, 776.  
 Buchner, F. S., 321, 322.  
 Buchheim, A., 136.  
 Buck, F. E., 439.  
 Buckman, H. O., 321.  
 Buckner, R., 899.  
 Buckner, G. D., 427, 871.  
 Buell, T. W., 798.  
 Bullock, W., 537.  
 Bunting, B., 47.  
 Bunzel, H. H., 225.  
 Burberry, H. A., 741.  
 Burdette, W. W., 120.  
 Burdick, R. T., 337.  
 Burge, W. E., 414.  
 Burgess, A. H., 724.  
 Burgess, P. S., 219.  
 Burk, L. B., 469.  
 Burke, R. T. A., 210, 321, 717.  
 Burlison, W. L., 96, 336.  
 Burn, R. R., 211, 212, 717.  
 Burnett, W. L., 651.  
 Burns, J. C., 866.  
 Burr, W., 689.  
 Burr, W. W., 798.  
 Burri, R., 572.  
 Rurrill, A. C., 648.  
 Burritt, T. J., 797.  
 Burrows, C. W., 485.  
 Burson, W. M., 690.  
 Burtt-Davy, J., 227, 435.  
 Busck, A., 855.  
 Buser, A. L., 617.  
 Bush, G. W., 896.  
 Bushnell, T. M., 211, 212, 213, 322.  
 Buss, W. J., 669.  
 Bussey, L. P. de, 351.  
 Butler, B. S., 425.  
 Butler, E. R. C., 576.  
 Butler, P., 798.  
 Buttel-Reepen, H. von, 362.  
 Butterfield, K. L., 96, 297, 308, 699.  
 Buttrick, P. L., 856.  
 Butzke, E. T., 280.  
 Byrd, P. E., 695.  
 Byers, W. C., 322.  
 Byrd, P. E., 695.  
 Cady, W. N., 699.  
 Caffey, F. G., 796.  
 Cahill, E. A., 188.  
 Cail, J. M., 208.  
 Cairne, J. T., 111, 695.  
 Calderon, J. M., 390.  
 Caldwell, J. S., 495.  
 Calhoun, F. H. H., 725.  
 Call, L. E., 338, 632, 820.  
 Calvin, J. W., 111.  
 Cambage, R. H., 742.  
 Cameron, A. E., 158.  
 Cameron, A. G., 489.  
 Cameron, A. T., 751.  
 Cameron, F. K., 100, 812, 821.  
 Campbell, G. H., 96.  
 Campbell, G. R., 885.  
 Campbell, L. E., 47, 240.

- Campbell, L. H., 794, 861.  
 Campbell, R. H., 239.  
 Campbell, W., 675.  
 Canina, E. G., 42, 43.  
 Cannon, W. A., 334, 430.  
 Canon, H., 164.  
 Cantrell, L., 215, 321, 418.  
 Capitani, G. L. de, 227.  
 Capus, J., 244, 543, 749.  
 Carlson, A. J., 463.  
 Carlyle, S., 98.  
 Carmichael, B. E., 567.  
 Carmody, J. H., 406, 695.  
 Carnes, H. M., 695.  
 Carpano, M., 280, 383.  
 Carpenter, C. W., 246.  
 Carpenter, F. A., 509.  
 Carpenter, P. H., 236.  
 Carpenter, T. M., 260.  
 Carr, M. E., 123, 321, 718.  
 Carr, R., 773.  
 Carrasco, E., 491.  
 Carré, H., 575.  
 Carreras, R., 299.  
 Carrero, J. O., 435.  
 Caruth, F. E., 381.  
 Carson, W. J., 97.  
 Carstarphen, W. T., 164.  
 Carstens, C. C., 41.  
 Carter, C. N., 447.  
 Carter, H. R., 358.  
 Carter, W. T., Jr., 213, 321, 617, 809.  
 Cartier, J., 517.  
 Carver, G. W., 859.  
 Carver, T. N., 207.  
 Cary, W. E., 760.  
 Case, L. L., 296.  
 Case, L. N., 477.  
 Cassatt, E. B., 869.  
 Castañeda, F., 309.  
 Castelbo, E., 299.  
 Castle, W. E., 499, 564, 864, 870.  
 Castro y Ramirez, R. de, 879.  
 Catalano, G., 500.  
 Cates, H. R., 529.  
 Cathcart, C. S., 45, 625, 639, 665.  
 Cattoretti, F., 168.  
 Caudell, A. N., 61, 255, 854.  
 Cave, T. W., 275.  
 Cazalbon, 576.  
 Cazin, 876.  
 César, E., 575.  
 Cetto, von, 391.  
 Cettolini, S., 235.  
 Chamberlain, C. J., 727.  
 Chambers, C. O., 97.  
 Chamlee, A. S., 295.  
 Chamot, E. M., 284, 285, 286.  
 Champin, M., 230, 735.  
 Chand, H., 441.  
 Chandler, B. A., 641, 837.  
 Chandler, W. H., 737, 833.  
 Chapin, R. M., 805, 806.  
 Chapin, W. S., 40.  
 Chapman, C. W., 732.  
 Chapman, H. G., 729.  
 Chapman, H. H., 441.  
 Chapman, W. H., 880.  
 Chappellier, A., 864.  
 Charms, D. d'E. de, 754.  
 Chatanay, J., 851.  
 Chatton, E., 851.  
 Chauvet, S., 761.  
 Chauriz, 331.  
 Chavan, P., 85.  
 Chidester, P. E., 756.  
 Childs, L., 552.  
 Chittenden, F. H., 755, 756.  
 Chittenden, F. J., 342, 527, 632.  
 Choldokovsky, N. A., 854.  
 Christensen, H. R., 499, 813.  
 Christian, R. V., 386.  
 Christie, H. R., 641.  
 Chrystal, R. N., 250, 651.  
 Chubbuck, M. E., 791.  
 Chudeau, R., 208, 320.  
 Church, F. O., 97.  
 Church, J. E., 308.  
 Clurea, J., 489.  
 Clark, A. L., 137.  
 Clark, E., 193.  
 Clark, E. K. O., 395.  
 Clark, H. B., 838.  
 Clark, H. W., 888.  
 Clark, J. A., 39.  
 Clark, L. N., 75.  
 Clark, W. M., 136, 524, 804.  
 Clarke, F. W., 222.  
 Clausen, 338.  
 Clausen, C. P., 162, 555.  
 Clausen, R. E., 225.  
 Clayton, H. H., 14.  
 Clegg, M. T., 850.  
 Cleland, J. B., 577.  
 Cline, I. M., 413.  
 Clinton, G. P., 52.  
 Clothier, R. W., 169.  
 Clough, P. W., 383.  
 Cloukey, H., 508.  
 Cnopf, J., 581.  
 Coad, B. R., 656.  
 Cobb, N. A., 50, 306.  
 Cobb, W. B., 717.  
 Cochel, W. A., 174, 175, 179, 400.  
 Cochrane, D. C., 613.  
 Cockerell, T. D. A., 66, 237, 341, 450, 552.  
 Cockerell, W. P., 857.  
 Cocks, A. W., 99.  
 Coffey, G. N., 222.  
 Coffey, J. S., 94.  
 Coffey, W. C., 400.  
 Coffman, J. H., 396.  
 Coggeshall, G. W., 27.  
 Colt, J. E., 285, 292.  
 Cole, C. G., 82.  
 Colegrove, C. P., 897.  
 Coleman, D. A., 217, 513.  
 Coleman, G. P., 391.  
 Coleman, L. C., 55.  
 Colin, H., 524.  
 Collens, A. E., 624, 854.  
 Collett, E. B., 896.  
 Collin, E., 460.  
 Collins, G. N., 306.  
 Collins, J. P., 546.  
 Collins, S. H., 670.  
 Collison, R. C., 725.  
 Commallonga y Mena, J., 367.  
 Compere, G., 55.  
 Compton, R. H., 55.  
 Comstock, A. L., 762.  
 Condal, J. F. y 745.  
 Cone, V. M., 527, 682, 881.  
 Congdon, L. A., 167.  
 Conklin, E. C., 409.  
 Conn, H. J., 499.  
 Connaway, J. W., 185, 280.  
 Connell, W. H., 484.  
 Conner, G. F., 891.  
 Connor, A. J., 320.  
 Connors, C. H., 143, 157, 161, 639.  
 Conrey, G., 418, 617.  
 Cook, A. J., 848.  
 Cook, A. S., 180.  
 Cook, F. C., 428, 625.  
 Cook, L. R., 874.  
 Cook, M. T., 153, 157, 309.  
 Cook, M. W., 674.  
 Cook, O. F., 306, 529.  
 Cook, R. C., 499.  
 Cooke, W. W., 158, 890.  
 Cooleedge, L. H., 679.  
 Cooley, G. W., 391.  
 Coolidge, P. T., 441.  
 Coons, G. H., 617, 744.  
 Cooper, W. F., 186, 350, 499.  
 Copeman, S. M., 254.  
 Cornish, L. C. V., 807.  
 Cornish, G. A., 599.  
 Corsaut, J. H., 350.  
 Cortelezzi, E. D., 478.  
 Cory, E. N., 62, 250.  
 Cory, H. V., 797.  
 Corr, V. L., 798.  
 Cosens, A., 362.  
 Cosmetato, C. P., 227.  
 Cotton, C. E., 183.  
 Coulter, S., 587.  
 Courtney, A. M., 461.  
 Couste, H., 869.  
 Coutant, A. F., 359.  
 Coventry, B. O., 46, 533.  
 Coville, F. V., 534.  
 Cow, D., 75.  
 Cowgill, H., 661.  
 Cox, S., 837.  
 Crabb, G. A., 321, 322.  
 Crabill, C. H., 32, 54.  
 Crabtree, P. E., 906.

- Crags, F. W., 857.  
 Craik, H. A., 98.  
 Craig, J. F., 576.  
 Craik, R. A., 383, 783.  
 Craighead, F. C., 361, 652.  
 Crandall, W. C., 623.  
 Crane, M. R., 42.  
 Cranfield, H. T., 471.  
 Crawford, D. L., 450.  
 Crawford, F. N., 199.  
 Crawford, J. C., 66, 363.  
 Crawley, J. T., 307.  
 Creel, R. H., 548.  
 Cresswell, C. G., 327.  
 Cregut, 314.  
 Criddle, N., 250.  
 Cripps, L. D., 272.  
 Crites, H. N., 412.  
 Crombust, H. R., 89, 688.  
 Croken, I. E., 784.  
 Crolas, 249.  
 Crosby, C. R., 250, 363, 451, 637, 738, 754.  
 Crosby, L. S., 296.  
 Crosby, W. W., 890.  
 Cross, W. E., 520.  
 Cross, R., 29.  
 Crossley, B. W., 529.  
 Crow, M. F., 290.  
 Crowe, E. T., 483.  
 Crouther, C., 299, 620.  
 Cross, W. V., 207.  
 Crumb, S. E., 255, 453.  
 Rutelüchle, J. S., 893.  
 Dade, D., 574.  
 Dalbreth, E. E., 496.  
 Dammis, E. H., 365.  
 Danliffe, R. S., 833.  
 Dunningham, C. C., 529.  
 Dunningham, M., 11.  
 Dunningham, S. W., 508.  
 Dunningham, T. H., 800.  
 Curry, B. E., 168, 521.  
 Curtis, H. E., 521, 822.  
 Curtis, M. R., 196, 480, 481.  
 Curtis, R. H., 14.  
 Curtis, R. W., 741.  
 Curtman, L. J., 112.  
 Cushing, H., 500.  
 Cushman, R. A., 362, 363.  
 Czapek, P., 33.  
 Dabber, M., 370.  
 Dakin, 564.  
 Dale, J. K., 408.  
 Dalrymple, W. H., 575, 679.  
 Dalrymple-Hay, R., 838.  
 Dam, W. van, 570, 574.  
 Dammann, K., 494.  
 Dawson, E. F., 600.  
 Dana, G. G., 588.  
 Dana, J. A., 97.  
 Dandeno, J. B., 98.  
 Darguard, P. A., 526.  
 Daniel, L., 32.  
 Daniels, A. L., 659.  
 Dann, A. B., 377.  
 Dantony, E., 540, 745.  
 Darbshire, A. D., 499.  
 Dare, H. H., 785.  
 Darlington, I. T., 507.  
 Darnell-Smith, G. P., 247, 541, 644, 745, 843, 845, 846, 848.  
 Darner, R. W., 279.  
 Darrin, M., 509.  
 Darrow, G. M., 534.  
 Dash, J. C., 753, 841.  
 Dassogno, L., 373.  
 Daudt, H. W., 205.  
 Daugherty, R. L., 482.  
 Davenport, C. B., 499.  
 Davenport, E., 598.  
 Davenport, R. W., 786.  
 Davidson, J., 653.  
 Davidson, J. B., 789.  
 Davidson, R. J., 497.  
 Davidson, W. M., 453.  
 Davies, G. R., 193.  
 Davies, H. J., 232.  
 Davis, B. F., 185.  
 Davis, B. M., 135, 499.  
 Davis, C. A., 332, 800.  
 Davis, E. G., 741.  
 Davis, F. W., 67.  
 Davis, H. P., 181, 182.  
 Davis, J. J., 62.  
 Davis, K. C., 693.  
 Davis, L. M., 269.  
 Davis, L. V., 322, 809.  
 Davis, M., 367, 368.  
 Davis, M. B., 341, 635.  
 Davis, N. J., 693.  
 Davis, R. P., 685, 686.  
 Davis, W. H., 93, 493.  
 Davis, W. P., 472.  
 Davison, G. H., 799.  
 Davy, J. B., 227, 435.  
 Dawson, C. F., 275.  
 Day, G. O., 651.  
 Day, L. H., 54.  
 Day, P. C., 118.  
 De, M. N., 552.  
 Dean, A. W., 391.  
 Dean, G. A., 61.  
 Dean, H. J., 284.  
 De Angells d'Ossat, G., 221, 786.  
 Dearborn, N., 180.  
 Dearden, W. F., 856.  
 Deardorff, C. E., 123.  
 Dearing, C., 834.  
 Dearness, J., 692.  
 De Bussy, L. P., 351.  
 De Capitani, G. L., 227.  
 Decarte, J. L., 715.  
 De Castro y Ramirez, R., 879.  
 De Charmoy, D. d'E., 754.  
 Decker, 660.  
 De Diesbach (Countess) R., 890.  
 De Dominicus, A., 324.  
 Dedonekele, R. R., 35.  
 Deem, J. W., 527.  
 Deeter, E. B., 119, 717.  
 De Fedtschenko, B., 227.  
 De Gryse, J. J., 553.  
 De Jong, A. W. K., 537.  
 De Jong, D. A., 575.  
 De Jong, D. J., 410.  
 De la Mare Norris, F., 255.  
 De Laporte, A. V., 889.  
 De la Rosa, G. F., 689.  
 Delépine, S., 463.  
 Del Guercio, G., 251, 360, 552.  
 Delwiche, E. J., 431.  
 De Mello Geraldine, C., 227.  
 De Mendonca, H. J. M., 391.  
 De Milly, J. W., 275.  
 De Emmerez de Charmoy, D., 754.  
 Demuth, G. S., 158.  
 Denniston, R. H., 345.  
 Dorden, J. H., 213.  
 De Roo, 576.  
 Derrick, B. R., 418, 810.  
 Descombes, P., 614, 615.  
 De Sigmund, A. A. F., 499.  
 Deslandres, H., 414.  
 Desmoullins, A., 234.  
 De Sornay, P., 816.  
 De Sousa e Faro, J. D. C., 301.  
 Detlefsen, J. A., 464.  
 Detwiler, S. B., 641.  
 Deuss, J. J. B., 168.  
 Deussen, A., 786.  
 De Verteuil, J., 831, 882.  
 de Vilhena, E. J., 391.  
 De Villèle, A., 665.  
 De Vine, J. F., 185.  
 De Vries, H. J. F., 713.  
 De Vries, J. J. O., 590, 671.  
 De Vries, M. S., 628.  
 De Vries, O., 634.  
 Dwy, J. A., 163.  
 Dewar, E. S., 263.  
 Dewey, G. W., 534.  
 DeWolfe, L. A., 93.  
 Dezan, S., 168.  
 Dixon, H. F., 643.  
 Dick, J. H., 44, 836.  
 Dickey, J. B. R., 417, 616.  
 Dieckman, G. P., 87.  
 Diehl, G. C., 890.  
 Diem, K., 510.  
 Diesbach, (Countess) R. de, 890.  
 Dietel, P., 744.  
 Dietrich, T., 311.  
 Dietrich, W., 471.  
 Dietz, P. A., 351.  
 Dimoth, P., 565.  
 Dillman, A. C., 528.  
 Dillon, J. J., 490.  
 Dimo, N. A., 16.

- Dines, W. H., 614.  
 D'Ipollito, G., 331.  
 Dir, W., 415.  
 Disselhorst, R., 195.  
 Ditz, H., 820.  
 Dixon, H. H., 727.  
 Dixon, H. M., 502.  
 Dixon, S. G., 856.  
 Doane, C. F., 273.  
 Doane, D. H., 493, 695.  
 Dobell, C., 458.  
 Dobrovolski, M. E., 843.  
 Dohy, G., 428.  
 Dodge, F. D., 501.  
 Dodge, R., 603.  
 Doidge, E. M., 242, 447, 649.  
 Dole, R. B., 786.  
 Dominicus, A. de, 324.  
 Donath, E., 818.  
 Doneghue, R. C., 35.  
 Doolittle, R. E., 601.  
 Doorn, W. T. C. van, 352.  
 Dorée, C., 11.  
 Dorogin, G., 840.  
 Dorrance, F., 49.  
 Dorset, M., 185, 273, 280.  
 D'Ossat G. de A., 221, 786.  
 Duterrere, W. D., 673.  
 Duocet, J. A., 578.  
 Dougherty, J. E., 268, 377.  
 Douie, J., 291.  
 Drake, R. H., 583.  
 Drennan, A. M., 675.  
 Drieberg, C., 697.  
 Drogla, L., 806.  
 Droste, 164.  
 Drouin, 576.  
 Drouin, V., 782.  
 Dry, F. W., 453.  
 DuBois, D., 68.  
 DuBois, E. F., 68.  
 Du Bois-Reymond, R., 201.  
 Ducháček, F., 574.  
 Duchastel, J., 890.  
 Duck, R. W., 497.  
 Dudgeon, G. C., 227, 491.  
 Duffee, F. W., 96.  
 Dugger, B. M., 532, 840.  
 Düggeli, M., 815.  
 Dunn, C. H., 258.  
 Dunn, J. E., 322.  
 Dunne, J. J., 271.  
 Dunnewald, T. J., 215, 617.  
 Dunstan, W. R., 491, 565.  
 DuPont, T. C., 739.  
 DuPorte, E. M., 250.  
 Durant-Gréville, 614.  
 Durham, S. B., 769.  
 Durst, C. E., 40.  
 Dryce, W. B., jr., 28.  
 Dusserre, C., 22, 24.  
 Dutcher, B. H., 477.  
 Dyar, H. G., 63, 64, 453, 553, 855.  
 Dymond, J. R., 663.  
 Dysyn, O. E., 184, 185.  
 Earle, F. S., 353, 446.  
 Earnshaw, F. L., 157.  
 Earp, 297.  
 Eason, C. M., 589.  
 East, E. M., 431, 499, 527.  
 Eastman, J. F., 693.  
 Eastwood, G. R., 199.  
 Eber, A., 575.  
 Eberhart, 624.  
 Ebersson, F., 479.  
 Eckles, C. H., 378.  
 Eckmann, E. C., 214, 322.  
 Eddy, E. D., 832.  
 Eddy, H. P., 886.  
 Edgerton, C. W., 300, 541, 846.  
 Edlbacher, S., 804.  
 Edmiston, H. D., 115, 118.  
 Edson, H. A., 156.  
 Edwardes Ker, D. R., 51, 724.  
 Eckhout, A. van den, 576.  
 Effront, J., 660.  
 Egbert, K. C., 199.  
 Ekerer, G., 409.  
 Égert, K. L., 844.  
 Eggstein, A. A., 674.  
 Ehrenberg, P., 419, 515, 816.  
 Ehrhardt, J., 881.  
 Ehrhorn, E. M., 59.  
 Eichorn, A., 184, 185, 385, 579, 879.  
 Eisler, M. von, 580.  
 Ekholm, N., 413.  
 Elford, F. C., 663.  
 Elliot, W. M., 687.  
 Ellenberger, W., 876.  
 Ellenberger, W. P., 479.  
 Ellenwood, F. A., 868.  
 Elliot, H. B., 477.  
 Elliott, E. C., 97.  
 Elliott, J. A., 440.  
 Ellis, A. J., 683.  
 Ellis, B. W., 295.  
 Ellis, D. C., 347.  
 Ellis, F. E., 890.  
 Ellis, W. O., 655.  
 Ellsworth, C. E., 786.  
 Emerick, E. J., 895.  
 Emerson, F. V., 121, 322.  
 Emerson, R. A., 500.  
 Emery, W. O., 502.  
 Emmeret de Charmoy, D. d', 754.  
 Emmerich, R., 766.  
 Erb, E. S., 133.  
 Eredia, F., 510.  
 Erf, O., 572.  
 Eriksson, J., 442.  
 Esbjerg, N., 696.  
 Escobar, R., 489.  
 Esmarch, F., 513.  
 Essig, E. O., 62, 361, 454, 857.  
 Etchegoyen, F., 308.  
 Etcheverry, B. A., 481, 482.  
 Etheridge, J. I., 341.  
 Euler, H., 711.  
 Eusface, H. J., 436.  
 Evans, A., 76.  
 Evans, G. H., 275.  
 Evans, H. M., 382.  
 Evans, I. B. P., 241.  
 Evans, R. J., 695.  
 Evaristo, G., 566.  
 Everest, A. E., 223, 335.  
 Evvard, J. M., 400.  
 Ewart, A. J., 30, 711.  
 Ewers, E., 506.  
 Ewing, H. E., 66.  
 Ewing, P. V., 189, 174.  
 Ezdorf, R. H. von, 553.  
 Fabre, H., 851.  
 Fabyan, M., 581.  
 Faes, H., 234.  
 Fagan, T. W., 270.  
 Fairchild, D., 45, 306.  
 Fairlie, A. M., 29.  
 Falckenstein, K. V. von, 18.  
 Fales, H. A., 408.  
 Fales, H. L., 461.  
 Falk, K. G., 111, 112.  
 Fall, H. C., 361.  
 Fallada, O., 350.  
 Faraut, 344.  
 Farley, A. J., 197.  
 Farmer, J. B., 199.  
 Farneth, R., 823.  
 Faro, J. D. C. de S. e, 391.  
 Farrar, H. A., 599.  
 Farrar, R. K., 793.  
 Farrell, F. D., 267.  
 Pascetti, G., 473, 572.  
 Fassig, O. L., 413, 603.  
 Paulwetter, R. C., 199.  
 Favili, H. B., 472.  
 Faville, A. D., 170, 467, 469, 667, 668.  
 Fawcett, C. J., 97.  
 Fawcett, G. L., 309.  
 Fawcett, H. S., 56, 353, 446, 447, 449.  
 Feagans, R. F., 837.  
 Fedtschenko, R. de, 227.  
 Feer, R., 863.  
 Fellitzen, H. von, 496, 725, 754.  
 Feldkamp, C. L., 414.  
 Fellenberg, T. von, 662.  
 Fellingua, F. B., 52.  
 Felt, E. P., 61, 251, 408, 752, 852.  
 Fenzi, E. O., 438.  
 Ferguson, G. J., 794.  
 Ferguson, R. H., 198.  
 Fernier, E. J., 789.  
 Fernald, H. T., 400, 654.  
 Fernald, M. C., 396.  
 Fernow, B. E., 238.  
 Ferrar, H. T., 513.  
 Ferry, E. L., 562, 862.

- Ferry, N. S., 184.  
 Fessenden, D. C., 740.  
 Fetter, L. W., 96.  
 Feytaud, J., 851.  
 Field, E. C., 444.  
 Field, J., 298.  
 Filler, C. C., 97.  
 Findlay, L., 890.  
 Fink, D. E., 555.  
 Finley, W. H., 685.  
 Finlow, R. S., 227.  
 Finzi, G., 480.  
 Fippen, E. O., 321, 417, 718.  
 Fior, J. W., 436.  
 Fischer, 588, 748.  
 Fischer, G., 88.  
 Fischer, H., 200.  
 Fischer, M. H., 801.  
 Fischer, P., 184, 185, 273.  
 Fischer, R., 509.  
 Fish, E. S., 563.  
 Fishburn, H. P., 797.  
 Fisher, C. W., 186.  
 Fisher, W. J., 614.  
 Fisher, W. S., 254.  
 Fish, W. W., 184.  
 Fiske, G. W., 895.  
 Fiske, J., 298.  
 Fiske, R. J., 752.  
 Fitch, C. L., 746.  
 Fitch, C. P., 280, 478, 781.  
 Fitch, J. B., 138.  
 Fitts, F. O., 909.  
 Fitzgerald, F. P., 12.  
 Fitzgerald, J. C., 477.  
 Fitzsimons, P. W., 855.  
 Flanz, S. B., 789.  
 Fleischner, E., 789.  
 Fleischmann, W., 670.  
 Fleming, C. E., 396.  
 Fletcher, A. B., 391.  
 Fletcher, C., 293.  
 Fletcher, T. B., 549.  
 Fletcher, W. F., 43, 833.  
 Fleurent, 256.  
 Flint, P. N., 174.  
 Flint, W. P., 757.  
 Flohr, L. B., 792.  
 Flora, S. D., 615.  
 Florence, L., 650.  
 Flores y Candal, J., 745.  
 Flossfeder, F. C. H., 544.  
 Foelt, H. W., 195, 196.  
 Foker, H., 854.  
 Folk, E. P., 296.  
 Fontaine, 576.  
 Fonces-Diacon, H., 643.  
 Forbes, D., 837.  
 Forbes, E. B., 315, 668.  
 Forbes, E. R., 185.  
 Forbes, S. A., 251.  
 Fortush, E. H., 650.  
 Foranah, N. H., 785.  
 Foreman, G. K., 804.  
 Forman, L. W., 722.  
 Formanek, G., 612.  
 Foster, A. C., 295.  
 Foster, J. H., 642.  
 Foster, W., 661.  
 Fothergill, C. F., 237.  
 Fowler, C. C., 663.  
 Francis, C. K., 577.  
 Francis, E., 659.  
 Francis, H. R., 345.  
 Francis, M. S., 44.  
 Frandsen, J. H., 671, 860.  
 Frankenfeld, H. C., 118.  
 Franklin, E. C., 716.  
 Franklin, H. J., 362, 363.  
 Franz, P., 255.  
 Fraps, G. S., 124, 126, 134, 163, 420, 421, 816.  
 Fraser, W. P., 51.  
 Frear, W., 115, 133, 142, 821.  
 Fred, E. B., 499.  
 Free, J., 614.  
 Freeman, A. W., 83, 88.  
 Freeman, B., 26.  
 Freeman, G. F., 232.  
 Freeman, W. G., 740, 854.  
 French, H. L., 100.  
 French, T. E., 487, 598.  
 French, W. H., 692.  
 Freund, H., 166.  
 Freybe, O., 14.  
 Friedrichsen, E., 873.  
 Friedmann, A., 572.  
 Friedmann, U., 249.  
 Friedenthal, H., 256.  
 Friedrich, A., 83.  
 Fries, J. A., 168.  
 Froggatt, W. W., 64, 652, 833.  
 Frölich, G., 100.  
 Fron, G., 851.  
 Frost, H. B., 237.  
 Frost, J. N., 576.  
 Frost, W. D., 113, 185.  
 Frost, W. S., 624.  
 Frothingham, E. H., 152.  
 Fry, W. H., 328.  
 Frye, T. C., 623.  
 Fullaway, D. T., 59.  
 Fuller, G. W., 81.  
 Fuller, R. W., 599.  
 Fulmer, E., 600.  
 Fulton, B. B., 62, 456, 653, 657.  
 Fulton, H. R., 49, 52, 53, 155, 156, 157, 198.  
 Funk, C., 561.  
 Funkhouser, W. D., 255, 366, 754.  
 Fyles, F., 444.  
 Gabathuler, A., 113.  
 Gage, G. E., 387.  
 Gage, V. R., 798.  
 Gahan, A. B., 362, 454.  
 Gall, A. D., Jr., 346.  
 Galbraith, A. J., 498.  
 Gairdner, A., 822.  
 Cajon, M., 741.  
 Gallé, P. H., 118.  
 Galloway, B. T., 307.  
 Galpin, C. J., 298.  
 Galpin, S. L., 328.  
 Gamble, J. A., 874.  
 Gamble, M. G., 295.  
 Gammage, A. L., 683.  
 Gammie, G. A., 227.  
 Gandara, G., 840.  
 Gangler, F. A., 10.  
 Gans, H., 466.  
 Garcia, F., 437.  
 Gard, M., 525.  
 Gardner, A. K., 233.  
 Garduer, C., 489.  
 Gardner, F. D., 128, 133, 139.  
 Gardner, J. A., 476.  
 Garino-Canina, E., 42, 43.  
 Garman, H., 458, 829, 855.  
 Garrett, F. W., 15.  
 Garrison, P. E., 488.  
 Gaskill, E. F., 231.  
 Gassner, G., 745.  
 Gastline, G., 851.  
 Gaston, 843.  
 Gates, R. B., 226, 629, 823.  
 Gauer, V. K., 207, 714.  
 Gaumont, L., 851.  
 Gautier, A., 624.  
 Gawalowski, A., 508.  
 Gay, C. W., 866.  
 Gay, F. P., 877.  
 Gearhart, C. A., 631.  
 Gearhart, W. S., 484, 635, 788.  
 Gebhard, K., 202.  
 Gedroits, K., 812.  
 Geerlings, H. C. P., 508.  
 Geib, W. J., 98, 215, 322, 418, 617, 798.  
 Geiger, F., 830.  
 Gelger, J. C., 572.  
 Geisert, B. F., 695.  
 Geller, C., 691.  
 Genderson Stort, C. G. J. A., van, 893.  
 Gentner, C., 51.  
 Gephart, F. C., 68.  
 Gerakdes, C. de M., 227.  
 Gérard, A., 742.  
 Cercio, G. del, 380, 552.  
 Gerhard, W. P., 799.  
 Gerlach, 596.  
 Germann, A. F. O., 414.  
 Gerstenberger, H. J., 558.  
 Gertb, E., 512.  
 Ghosh, C. C., 657.  
 Gibson, A., 251.  
 Gibson, J. L., 184, 274.  
 Gibson, W. H., 98.  
 Gickhorn, J., 223.  
 Giffard, W. M., 556.

- Gigon, A., 661.  
 Gilbert, A. H., 541.  
 Gilbert, B. D., 322, 717.  
 Gilbert, C. D., 488.  
 Gilbert, S. D., 391.  
 Glickrist, D. A., 379, 426.  
 Glie, P. L., 435.  
 Gili, C. O., 895.  
 Gili, W., 743.  
 Gillam, L. G., 97, 295.  
 Gillespie, L. J., 504.  
 Gillet, M. A., 13.  
 Gillette, C. P., 357, 548, 651.  
 Gillette, J. M., 193, 790.  
 Gilliland, S. H., 185, 678.  
 Gilman, J. C., 542.  
 Giltner, W., 714, 727, 732, 746, 776, 777.  
 Groll, G. B., 491.  
 Grant, A. A., 95, 393, 456, 556, 557, 857.  
 Girola, C. D., 434.  
 Girtton, E., 96.  
 Gismond, A., 164.  
 Giuliani, R., 874.  
 Given, G., 816.  
 Given, G. C., 127.  
 Givonne, L., 483.  
 Gladden, W., 297.  
 Gladwin, F. R., 445.  
 Gialayer, A. R., 477.  
 Glasser, K., 575.  
 Glenn, P. A., 162, 254.  
 Glenn, A. T., 579.  
 Glotfelter, C. W., 798.  
 Glover, G. H., 576.  
 Glover, J. W., 190.  
 Gloyer, W. O., 249, 853.  
 Gobert, 365.  
 Gockel, A., 614.  
 Godbillie, P., 879.  
 Goddard, H. N., 597.  
 Godet, C., 43.  
 Goetsch, E., 765.  
 Güllert, V., 482.  
 Goldbeck, A. T., 787.  
 Goldberger, J., 258, 259, 764.  
 Goldenweiser, E. A., 583.  
 Golding, J., 218, 807.  
 Goldman, E. A., 827, 850.  
 Goldoni, E., 270.  
 Goldschmidt, H., 878.  
 Goll, H. L., 793.  
 Gonzales, A., 299.  
 Good, E. S., 185, 665.  
 Goodale, H. D., 870.  
 Goodman, A. L., 122, 322, 511, 616.  
 Goodman, F. L., 637.  
 Goodspeed, T. H., 138, 225.  
 Goodspeed, W. D., 533.  
 Goodwin, W. H., 851.  
 Gookin, B. T., 808.  
 Goot, P. van der, 758.  
 Gordon, A., 490.  
 Gordon, W. U., 278.  
 Gorini, C., 76, 766.  
 Gortner, R. A., 30.  
 Goss, W. F. M., 715.  
 Goss, W. L., 832.  
 Gossard, O., 199.  
 Gott, E. J., 567, 680.  
 Gottfried, A., 761.  
 Gottschalk, A. L. M., 440.  
 Gough, L. H., 227.  
 Gougler, F. A., 97.  
 Gould, A., 372.  
 Gould, R. A., 718.  
 Gourley, J. E., 833.  
 Gowdey, C. C., 453, 549.  
 Grabe, G. H., 497.  
 Graber, L. F., 431.  
 Grabe, E., 762.  
 Grabe, V., 427.  
 Graham, J., 591.  
 Graham, R., 274, 583, 680, 681, 781.  
 Graham, W. A., 288.  
 Gramlich, H. J., 587.  
 Grant, W., 885.  
 Grantham, A. E., 138.  
 Gratz, O., 76.  
 Grath, E., 681.  
 Graves, A. H., 546.  
 Graves, H. S., 307, 640.  
 Graves, S. S., 202, 412.  
 Gray, C. E., 576.  
 Gray, D. T., 2, 496.  
 Gray, G. P., 232.  
 Gray, H. L., 689.  
 Gray, R. A. H., 654.  
 Graybill, H. W., 479.  
 Green, E. E., 552.  
 Green, R. P., 899.  
 Green, W. J., 530.  
 Greene, E. P., 767.  
 Greene, J. H., 96.  
 Greenwald, L., 613.  
 Gregory, C. T., 739.  
 Gregory, R. P., 226, 732, 822.  
 Greig-Smith, R., 218, 499.  
 Greisencrager, J. K., 38.  
 Greva, L., 769.  
 Gréville, D., 614.  
 Griffin, E. G., 803.  
 Griffin, F. L., 97, 296.  
 Griffith, D., 293.  
 Griffith, F., 782.  
 Grigorieff, P., 806.  
 Grimes, E. J., 120, 322.  
 Grindley, H. S., 412.  
 Grinnell, J., 547.  
 Grisdale, F. S., 98.  
 Grissom, J. G., 488.  
 Grohmann, 516.  
 Groom, P., 849.  
 Grossenbacher, J. G., 442.  
 Groth, B. H. A., 135, 146.  
 Grove, W. E., 895.  
 Grover, N. C., 884.  
 Grunsky, C. E., 882.  
 Guareschi, I., 804.  
 Guéguen, M. F. P. V., 100.  
 Guerrero, G. del, 251.  
 Guggenbuhl, M., 777, 778.  
 Gugoni, C., 74.  
 Gulgnard, L., 525.  
 Guilbert, G., 614.  
 Guilford, W. S., 268.  
 Guillaume, 575.  
 Guillermond, A., 524, 627.  
 Guinn, F. B., 152.  
 Gutleras, J., 754.  
 Güldenpfennig, H., 468.  
 Gunter, E., 321.  
 Gunter, H., 321.  
 Gurney, E., 700.  
 Gurney, W. B., 833, 851.  
 Gussow, H. T., 247, 300.  
 Guthrie, C. P., 661.  
 Guthrie, F. B., 227, 517.  
 Guttenberg, A. von, 347.  
 Gvozdenović, F., 847.  
 Gyárfás, J., 519, 820.  
 Haase, C., 82.  
 Haberlandt, G., 561.  
 Hackleman, J. C., 635.  
 Hadley, C. H., jr., 451.  
 Hadley, F. B., 679, 794.  
 Hadlington, J., 192.  
 Hadwen, S., 881.  
 Haecker, V., 370, 468.  
 Haempel, O., 58.  
 Haen, A. E., 386.  
 Haggard, M. J., 798.  
 Hägglund, E., 608.  
 Haglund, E., 574.  
 Halph, W. D., 712.  
 Halnes, H. H., 837.  
 Hale, P. H., 689.  
 Hall, A. D., 22, 100, 731.  
 Hall, A. S., 686.  
 Hall, E. C., 129, 322.  
 Hall, F. H., 344, 473, 651, 674.  
 Hall, I. C., 186.  
 Hall, L. D., 399, 399.  
 Hall, M., 615.  
 Hall, M. C., 280, 552, 753.  
 Haller, C., 280.  
 Hallman, E. T., 777.  
 Hallsted, A. L., 338.  
 Halnan, E. T., 298.  
 Halpin, J. G., 481, 873.  
 Halski, T., 576.  
 Halsted, R. D., 134, 144.  
 Hamburger, H. J., 503.  
 Hamilton, G. E. H. E., 57.  
 Hammer, B. W., 77, 78, 778.  
 Hancher, K. G., 96.  
 Hancock, W. J., 599.  
 Haney, J. W., 539.  
 Haney, L. H., 488.  
 Haen, J. von, 13.  
 Hannah, A., 208.

- Hannon, B. E., 861.  
Hansen, E., 639.  
Hansen, J., 565.  
Hansen, P., 888.  
Hanson, C. E., 789.  
Hanson, P., 616.  
Hansson, H., 575.  
Hansson, N., 468.  
Hanzawa, J., 539.  
Haralson, C., 637.  
Harbord, G., 231.  
Harcourt, G. A., 98.  
Harcourt, R., 365.  
Harl, H. A., 322.  
Harlin, A., 318.  
Harding, A. R., 570.  
Harding, F. W., 264.  
Harding, S. T., 281.  
Harding, T. S., 313, 408.  
Harding, V. J., 505.  
Hardison, R. B., 124, 212, 221, 418.  
Hardman, R. C., 889.  
Harly, A. D., 626.  
Hargreaves, E., 452.  
Hargiz, C. M., 185, 274, 278.  
Harmed, R. W., 555, 757.  
Harpending, H. C., 600.  
Harper, J. D., 599.  
Harrington, C., 380.  
Harrington, T. P., 885.  
Harris, F. S., 125, 598, 695.  
Harris, J. A., 30, 379.  
Harrison, F., 799.  
Harrison, T. J., 98.  
Hart, E., 328.  
Hart, E. B., 72, 221, 261, 490, 501.  
Hart, H. M., 800.  
Hart, W. R., 394.  
Harter, L. L., 441, 646.  
Hartley, P., 501.  
Hartman, F. T., 752.  
Hartung, W. J., 646.  
Hartwell, B. L., 499, 699.  
Hartzell, F. Z., 65.  
Harvey, B. T., 629.  
Harvey, E. M., 243, 626.  
Hasehloff, E., 19, 26, 27.  
Hassman, L., 62, 754, 758.  
Haskell, C. G., 282.  
Haskell, S. B., 600.  
Haskins, C. N., 414.  
Haskins, H. D., 558, 624.  
Hassam, T. P., 273, 280, 386.  
Hasschaleh, K. A., 861.  
Hasschling, H., 426, 522.  
Hastings, C. S., 413.  
Hastings, E. G., 78.  
Hatal, S., 263.  
Hatch, W. H., 8.  
Hatchfield, W. D., 520.  
Hatt, W. K., 87, 485.  
Haupt, W., 314, 328, 609, 813.  
Davner, H. H., 187.  
Hawes, A. F., 837.  
Hawk, P. B., 659, 663, 783, 802, 863.  
Hawker, H. W., 210, 213, 717.  
Hawkins, L. A., 351, 426, 521, 522.  
Hawkins, L. S., 395.  
Hay, R. D., 838.  
Hayden, C. C., 470, 670.  
Hayden, C. J., 739.  
Hayduck, F., 801.  
Hayes, H. K., 431.  
Hayes, J. B., 873.  
Haynes, W., 370.  
Hays, M. E., 97.  
Hays, W. M., 14.  
Hazen, A., 415.  
Head, A. F., 810.  
Headen, W. P., 330.  
Headlee, T. J., 64, 158, 160.  
Heald, F. D., 56, 545, 644, 647.  
Heald, F. E., 335.  
Healey, M. M., 599.  
Healy, D. J., 185, 597, 581, 582, 680.  
Healy, L. H., 699.  
Heard, H. C., 495.  
Hearn, W. E., 321.  
Heath, L. J., 808.  
Hecke, L., 51.  
Heckel, E., 434.  
Hector, J. M., 352.  
Hedgcock, G. G., 242, 353, 448.  
Hedrick, U. P., 42, 234.  
Hegnauer, L., 98.  
Heide, von der, 105.  
Heide, R. von der, 376.  
Heldenreich, E. L., 685.  
Heljue, K., 345.  
Helmberger, L., 762.  
Heinrich, C., 553.  
Helnze, R., 662.  
Helse, G. W., 389.  
Helst, G. D., 682, 778.  
Helbig, 537.  
Helder, G. K., 495.  
Heller, L. L., 78.  
Hellesen, E., 402.  
Helmreich, J. A., 493.  
Helten, W. M. van, 344.  
Helyar, J. P., 832.  
Henderson, G. S., 227.  
Hendrick, J., 22, 298, 560, 621.  
Hendricks, W. R., 97.  
Hendricks, F., 576.  
Hendrix, R. M., 71.  
Hendrixson, W. S., 409.  
Henkeweyer, A., 531.  
Henny, D. C., 388.  
Henry, A. J., 84, 509, 614.  
Henry, G., 890.  
Henry, G. H., 890.  
Henry, G. J., 483.  
Henry, W. A., 261.  
Henshaw, F. F., 284, 584.  
Herke, S., 820.  
Herman, V. R., 831.  
Hermann, H. A. van, 437, 833.  
Herns, W. B., 850.  
Heron, K. A., 387, 388, 890.  
Herrera, D. A., 835.  
Herrick, G. W., 63, 357, 651, 755, 756.  
Herrick, M. T., 894.  
Herrick, W. W., 478.  
Hershlberger, J. P., 130.  
Hesler, R. S., 322.  
Hess, E., 575.  
Hess, R., 167.  
Heubner, W., 10.  
Heukels, H., 629.  
Hewes, L. J., 190.  
Hewitt, C. G., 400.  
Heyward, R., 898.  
Hibbard, B. H., 792, 892.  
Hibbard, P. L., 133.  
Hibbard, R. P., 732, 827.  
Hibshman, E. K., 141, 142.  
Hicken, C., 306.  
Hicks, W. B., 125.  
Higgins, A. L., 321.  
Higgins, B. B., 747.  
Higgins, L., 885.  
Hightower, G. B., 322.  
Hildebrandt, F. M., 817.  
Hilgard, E. W., 301, 499.  
Hill, C., 391.  
Hill, C. J., 76.  
Hill, D. H., 496.  
Hill, G. F., 581.  
Hill, G. B., jr., 695.  
Hill, R. G., 41.  
Hill, R. L., 506.  
Hill, R. R., 868.  
Hilliard, C. M., 382.  
Hillman, F. H., 832.  
Hills, F. B., 797.  
Hills, J. L., 96, 332, 337, 371, 596.  
Hiltner, L., 51, 518, 850.  
Hilton, C., 185.  
Himmelberger, L. R., 583, 679, 680, 681, 777.  
Hindede, M., 769.  
Hinde, E., 276.  
Hinds, W. E., 65, 163, 458.  
Hinton, M. A. C., 57.  
Hintze, K., 464.  
Hirsch, P., 578.  
Hiscox, G. D., 287.  
Hitchcock, A. S., 226.  
Hoagland, D. R., 328.  
Hoare, E. W., 876.  
Hodday, F., 576.  
Hobson, A., 792.  
Hoering, P., 618.  
Hoffman, M. H., 793.

- Hoffmann, J. F., 807.  
 Hoffmann, M., 622, 664, 821.  
 Hofmeister, F., 459.  
 Hogue, M. J., 858.  
 Holbrook, A. G., 35, 72.  
 Holbrook, F. M., 269.  
 Hole, R. S., 347, 547.  
 Holland, E. O., 97.  
 Holland, L. B., 535.  
 Holland, R. E., 396.  
 Holland, W. J., 552.  
 Holte, H., 825.  
 Holte, W., 331.  
 Hollister, N., 850.  
 Holmes, A., 710.  
 Holmes, A. D., 10, 364.  
 Holmes, J. A., 716.  
 Holmes, J. S., 642.  
 Holmes, L. C., 120, 322.  
 Holmes, R., 341.  
 Holt, L. E., 461.  
 Holtz, H. F., 39.  
 Homer, A., 505.  
 Honcamp, F., 72, 100, 371.  
 Honda, K., 414.  
 Hoobler, B. R., 68.  
 Hood, J. D., 61, 62, 255, 356, 550.  
 Hooker, H. D., jr., 223.  
 Hooper, C. H., 341.  
 Hooper, J., 895.  
 Hooper, J. J., 472, 670.  
 Hopkins, A. D., 361.  
 Hopkins, C. G., 15, 22, 806.  
 Hopkins, F. G., 167.  
 Hopkins, G. S., 188.  
 Hopkins, S. H., 380.  
 Hopkinson, J., 320.  
 Hornby, H. E., 275.  
 Horne, A. S., 440, 452.  
 Horne, W. T., 53.  
 Horowitz, B., 33.  
 Horta, P. de F. P., 576.  
 Horton, A. H., 109.  
 Horton, R. E., 615.  
 Horton, T., 790.  
 Hoskins, H. P., 366.  
 Hosseus, C. K., 742.  
 Hostermann, G., 233, 234, 727.  
 Hotchkiss, L. J., 685.  
 Hotchkiss, W. O., 86.  
 Hotson, J. W., 648, 693.  
 Hottes, A. C., 237.  
 Houser, J. S., 551.  
 Houser, T., 444.  
 Howard, A., 35, 36, 37, 39, 514.  
 Howard, C. D., 205.  
 Howard, G. L. C., 35, 36, 37, 39, 514.  
 Howard, J. T., 467.  
 Howard, L. O., 449, 453, 755, 756, 854.  
 Howell, A. H., 850.  
 Howell, W. L., 344, 542.  
 Howes, E. A., 98.  
 Hoy, B., 436.  
 Hoyt, J. C., 786.  
 Hubbard, E. L., 535.  
 Hubbard, P., 318, 684, 685.  
 Huber, H. F., 144.  
 Hubert, E. E., 448, 649.  
 Hubert, H., 208.  
 Hudson, C. S., 813, 408.  
 Hudson, E. W., 495.  
 Hudson, M. O., 489.  
 Huebner, G. G., 595.  
 Huels, F. W., 786.  
 Huening, H. L., 67.  
 Hughes, D. A., 876.  
 Hulbert, R., 661.  
 Hulet, G. A., 410.  
 Hulton, F., 578.  
 Humbert, E. P., 600.  
 Humbert, J. G., 444, 642.  
 Hume, A. N., 230, 735.  
 Hummel, W. G., 394.  
 Humphrey, C. J., 56.  
 Humphrey, H. N., 485.  
 Humphrey, J. R., 896.  
 Humphreys, W. J., 118, 615.  
 Humphries, A. E., 227.  
 Hundertmark, R. E., 774, 777, 789.  
 Hungerford, H. B., 66.  
 Hunt, B. W., 900.  
 Hunt, C. L., 861.  
 Hunt, G. M., 153.  
 Hunt, H. A., 118.  
 Hunt, T. F., 128, 791.  
 Hunter, J. M., 295.  
 Hunter, W. D., 554.  
 Hunziker, O. F., 774.  
 Purd, C., 497.  
 Hurd, W. D., 699.  
 Hurley, J. C., 732.  
 Hurst, I. A., 119, 120, 321, 322.  
 Husmann, G. C., 834, 835.  
 Hutchinson, A. N., 295.  
 Hutchinson, C. M., 711.  
 Hutchinson, H. B., 218, 221.  
 Hutchison, R. H., 654.  
 Hutton, F. Z., 122.  
 Hutton, J. A., 227.  
 Hutton, J. G., 735.  
 Hutya, F., 575.  
 Hyslop, J. A., 558.  
 Iachevskii, A., 842.  
 Iachevskii, G., 846.  
 Iakushkin, I. V., 329, 330.  
 Ibois, J., 847.  
 Iddings, E. J., 767.  
 Ince, J. W., 37, 39.  
 Ingalls, R., 894.  
 Ippolito, G. d., 331.  
 Irving, W., 45.  
 Isaachsen, H., 873.  
 Isham, R. M., 811.  
 Isherwood, J. P., 580.  
 Ishida, M., 656.  
 Ishiware, T., 277.  
 Isles, T. V., 344.  
 Israelsen, O. W., 282, 698.  
 Issoglio, G., 113.  
 Ivens, E. M., 87.  
 Ives, F. W., 487, 598.  
 Ivins, L. S., 92.  
 Ivy, R. H., 275.  
 Jaccard, P., 536.  
 Jackson, C. M., 705.  
 Jackson, F. H., jr., 684, 899.  
 Jackson, H. H. T., 158.  
 Jackson, H. S., 199, 352, 840.  
 Jackson, H. W., 175, 178, 179.  
 Jackson, J. Q., 263.  
 Jacobs, P. S., 498.  
 Jacobson, C. A., 185, 710.  
 Jaczewski, A., 842.  
 Jaczewski, G., 846.  
 Jaffa, A. S., 462.  
 Jahnke, E. W., 97.  
 Jakouchkine, I., 865.  
 James, E. A., 890.  
 James, M. C., 793.  
 Jamieson, A. P., 458.  
 Jank, J. K., 166.  
 Janner, N. W., 366, 507.  
 Jardim de Vilhena, E., 391.  
 Jardine, J. T., 566.  
 Jarvis, E., 556.  
 Jeffreys, H., 614.  
 Jeffries, R. R., 637.  
 Jenkins, C., 97.  
 Jenkins, E. H., 520.  
 Jenkins, W. C., 414.  
 Jennings, A. H., 554.  
 Jennings, H., 321, 322, 618.  
 Jennings, H. S., 500, 764.  
 Jensen, L., 244.  
 Jensen, L. P., 535.  
 Jensen, O., 76, 77.  
 Jimenez, F. W., 834.  
 Jimenez, R. M., 306.  
 Jobbins-Pomeroy, A. W., 758.  
 Jobling, J. W., 674.  
 Joddl, S. L., 409, 712.  
 Joest, E., 82.  
 Johns, C. O., 11.  
 Johnson, A. K., 67, 258, 366, 661.  
 Johnson, A. N., 390.  
 Johnson, D. S., 430.  
 Johnson, H. V., 374.  
 Johnson, H. W., 93, 112.  
 Johnson, J. M., 408.  
 Johnson, O. R., 393.  
 Johnson, P. M., 759.  
 Johnson, R. S., 569.  
 Johnson, S., 800.  
 Johnson, W. T., jr., 165.  
 Johnston, E. S., 817.  
 Johnston, J. A., 662.

- Johnston, J. R., 439, 847.  
 Johnston, T. H., 543, 549.  
 Jolles, A., 808.  
 Jolly, N. W., 239.  
 Joly, A., 777.  
 Joly, G., 576.  
 Jone, H., 612.  
 Jones, C. B., 467, 668.  
 Jones, C. H., 332, 371.  
 Jones, C. P., 624.  
 Jones, C. R., 651.  
 Jones, C. S., 267.  
 Jones, E. M., 122, 322, 511.  
 Jones, G. B., 211, 213, 322, 617.  
 Jones, G. R., 600.  
 Jones, H. D., 873.  
 Jones, J., 438.  
 Jones, J. M., 265.  
 Jones, L. R., 444, 542.  
 Jones, O. L., 466.  
 Jones, R., 784.  
 Jones, R. C., 473.  
 Jones, S. A., 454, 896.  
 Jones, S. C., 122, 322.  
 Jones, T. H., 752.  
 Jones, V. R., 97.  
 Jones, W. J., jr., 263.  
 Jong, A. W. K. de, 537.  
 Jon, D. A. de, 575.  
 Jonz, D. J. de, 410.  
 Jordan, F. W., 413.  
 Jordan, S. M., 97.  
 Jordan, W. H., 400.  
 Joril, E., 51.  
 Jørgensen, I., 731.  
 Joseph, 510.  
 Joyce, A. V., 795.  
 Judd, C. S., 837.  
 Judd, R. C., 509.  
 Joll, M. A., 377, 470.  
 Jumelle, H., 533, 829, 838.  
 June, 747.  
 Jungelson, A., 31.  
 Jurney, R. C., 212, 418.  
 Kadel, B. C., 509.  
 Kadoosa, G., 857.  
 Kahn, M., 780.  
 Kaiser, K., 423.  
 Kalbfus, J., 152, 650.  
 Kalins, J. W., 782.  
 Kallert, E., 879.  
 Kaluzskii, A. A., 424.  
 Kämperling, Z., 898.  
 Kappeller, G., 761.  
 Kappen, H., 25.  
 Karper, R. E., 798.  
 Kasatkin, D. N., 112.  
 Kasim, 413.  
 Kastle, J. H., 185, 620, 680, 604, 871.  
 Katz, J. R., 858, 859.  
 Katz, K., 880.  
 Kaupp, B. F., 80, 185, 269, 682, 871, 881.  
 Kayser, E., 77.  
 Kazakov, A. V., 220, 329.  
 Keane, C., 275.  
 Keane, C. A., 711.  
 Kearney, T. H., 529.  
 Keatinge, G. F., 690.  
 Keeble, F., 732.  
 Keefer, F. R., 369.  
 Keegan, P. Q., 522.  
 Keeler, R. F., 199.  
 Keffer, C. A., 635.  
 Kellin, D., 557.  
 Kelsor, 588.  
 Keltt, G. W., 538.  
 Keltt, T. E., 519.  
 Kelkar, N. V., 239.  
 Kellaway, H. J., 238.  
 Kellerman, M., 43.  
 Kelley, C. F., 45.  
 Kellogg, D. C., 436.  
 Kellogg, E. H., 10, 19, 20, 27, 409, 712.  
 Kellogg, J. W., 72.  
 Kellogg, V. L., 274.  
 Kelly, E., 874.  
 Kelly, F. L., 572.  
 Kempster, H. L., 377, 391.  
 Kenety, W. H., 640.  
 Keppeier, G., 589.  
 Ker, D. R. E., 51.  
 Kerbert, H. J., 230.  
 Kerkhoven, A. R. W., 249.  
 Kera, F. D., 300.  
 Kerr, E. W., 487.  
 Kerr, J. A., 321.  
 Kerr, J. M., 682.  
 Kerr, R. R., 269.  
 Kerr, W. H., 896.  
 Kershaw, J. B. C., 15.  
 Keuchenius, P. E., 740.  
 Kezer, A., 527, 630.  
 Khvol'son, E. A., 207.  
 Kiernan, J. A., 185.  
 Kiese, 750.  
 Kiesselbach, T. A., 665.  
 Kile, O. M., 586.  
 Kilgore, B. W., 2, 426, 434, 727.  
 Kilmer, F. B., 236.  
 Kimball, D. D., 70.  
 Kimball, H. H., 117, 413, 415, 614.  
 Kimball, J. H., 413.  
 King, C. J., 510.  
 King, C. M., 832.  
 King, H. D., 564.  
 King, L. Y., 238.  
 King, W. E., 583.  
 King, W. V., 358.  
 Kingsbury, J. T., 497.  
 Kinloch, J. P., 356.  
 Kinman, C. F., 736.  
 Kinney, W. M., 685.  
 Kinsley, A. T., 477.  
 Kirk, N. M., 418.  
 Kirkland, B. P., 441.  
 Kirkpatrick, W. F., 770.  
 Kirkwood, J. E., 539.  
 Kisskalt, K., 876.  
 Kitt, T., 386.  
 Klebahn, H., 49.  
 Kleinschmidt, E., 494.  
 Klotz, O., 615.  
 Knab, F., 64, 65, 359, 862, 453, 553, 554, 556, 857.  
 Knapp, B., 688.  
 Knapp, H. B., 833.  
 Knapp, I. N., 884.  
 Knight, G. W., 612.  
 Knight, H. G., 615.  
 Knight, H. H., 255, 657.  
 Knobel, E. W., 123, 616.  
 Knorr, F., 228, 231.  
 Knowles, A. D., 583.  
 Knowles, N. S., 794, 861.  
 Kouth, F., 478, 575.  
 Kobayashi, H., 858.  
 Kober, P. A., 202, 409, 412.  
 Kobert, 466.  
 Kobzareno, 275.  
 Koch, A., 326.  
 Koch, G. P., 20, 422.  
 Kocher, A. E., 213, 322.  
 Kochergin, S., 328.  
 Kochetkov, V. P., 112, 220, 331.  
 Köck, G., 834.  
 Kolb, F. W., 119, 210, 321.  
 Kolthörster, W., 615.  
 Kolls, A. C., 370.  
 Kolmer, J. A., 682, 779, 877.  
 Kolthoff, I. M., 410.  
 König, J., 626, 687.  
 Koning, C. J., 12, 113.  
 Konstantinoff, S. W., 459.  
 Kooper, W. D., 875.  
 Koopman, I., 662.  
 Kopeloff, N., 217, 499, 513.  
 Köppen, V., 118.  
 Korinek, C. J., 383.  
 Korstian, C. F., 641.  
 Kossel, 804.  
 Kosutiny, T., 99.  
 Kotinsky, J., 357.  
 Kowalski, M. J., 56.  
 Krak, J. H. B., 98.  
 Kranich, 677.  
 Kratzmann, E., 525.  
 Kraus, E. J., 341, 497, 635.  
 Krauss, E. E., 685.  
 Krauss, R. B., 504, 580.  
 Kraybill, H. R., 142.  
 Krehan, M., 333.  
 Kremers, R. E., 237, 345.  
 Kressmann, F. W., 839.  
 Krivobokor, P. I., 329.  
 Krongold, S., 876.  
 Krüger, E., 319.  
 Krumwiede, C. jr., 473.  
 Krupp, L. A., 589.  
 Krupski, A., 780.

- Krusekopf, H. H., 122, 322.  
 Kuhl, H., 459, 600.  
 Kuhlman, A. K., 617.  
 Kühr, C. A. H. von W., Jr., 217.  
 Kulp, W. L., 183.  
 Kullmoff, C. J., 560.  
 Kumagal, Y., 43.  
 Kumerth, W., 488.  
 Kurdiunov, N. V., 363, 449.  
 Küster, 564.  
 Küster, E., 49.  
 Kuttner, O., 370, 466.  
 Kuyper, J., 627, 628.  
 Kuzirian, S. B., 610.  
 Kyokwai, H., 348.  
 Kyropoulos, S., 815.  
  
 Lang, A. M. W. ter, 848.  
 Lanke, E. W., 554.  
 Laan, A. van der, 279.  
 La Bach, J. O., 166.  
 Lahy, E. P., 344.  
 Lacour, H., 687.  
 Lacroix, J. V., 477.  
 Ladd, E. F., 67, 256, 366, 496, 661, 769.  
 Ladd, M., 258.  
 Ladd, N. M., 650.  
 Laine, E., 512.  
 Lalim, A., 873.  
 Lalla, L. M., 413.  
 Lamb, G. N., 347, 536.  
 Lamb, P. H., 227.  
 Lamb, W. A., 884.  
 Lamborn, W. A., 861.  
 Lamon, H. M., 196.  
 Lampé, A. E., 581.  
 Lamson, G. H., Jr., 655.  
 Lan, 344.  
 Landes, S. W., 794.  
 Landis, W. S., 28.  
 Lane, C. H., 293, 697, 799.  
 Lanfear, V., 480.  
 Lanfranchi, A., 385, 576.  
 Lang, F., 518.  
 Lang, R., 811.  
 Lang, R. M., 763.  
 Langer, G. A., 835.  
 Langstein, L., 460.  
 Langworthy, C. F., 364, 369.  
 Langworthy, H. V., 732.  
 Lanham, T. D., 895.  
 Lantz, C. W., 348.  
 Lantz, D. E., 751.  
 Lapham, J. E., 321.  
 Laplume, 376.  
 Larmellère, J., 544.  
 Larrison, G. K., 284.  
 Larsson, N., 431.  
 Lathrop, E. C., 327.  
 Latimer, W. J., 124, 321, 322, 418.  
 Laubert, R., 750.  
 Lauder, A., 276, 299.  
 Laurgard, O., 85.  
  
 Lavtalle, P., 164.  
 Lawrence, G., 98.  
 Lawrence, H., 626.  
 Lawrence, J. V., 30.  
 Laws, H. E., 186.  
 Lazenby, W. B., 731.  
 Drake, A. H., 291.  
 Leather, J. W., 514, 818.  
 Lebedeva, A. A., 849.  
 Lebediantzev, A. N., 410.  
 Lebour, M. V., 558.  
 Lechmere, E., 750.  
 Leclanche, E., 575, 781.  
 Le Clair, C. A., 420, 695.  
 Lee, A. R., 569.  
 Lee, E., 100.  
 Lee, F. S., 70.  
 Lee, L. L., 616.  
 Leech, G. E., 184.  
 Leer, L., 595.  
 Lees, A. H., 253.  
 Leeuwen, J. F. H. L. van, 880.  
 Leeuwen-Reijnvaan, J. van, 549.  
 Leeuwen-Reijnvaan, W. van, 549.  
 Leffmann, H., 600, 611.  
 Lefroy, H. M., 449.  
 Leggett, H. A. D., 97.  
 Leiby, R. W., 357, 755.  
 Leighty, C. E., 230.  
 Lemolne, A., 660.  
 Lenard, P., 414.  
 Lende-Njaa, J., 518.  
 Leng, C. W., 556.  
 Leonard, M. D., 356, 451, 657.  
 Leonard, W. E., 289, 488.  
 Leoncol, G., 623.  
 Lepiae, 516.  
 Lepiae, F., 491, 718.  
 Lesac, P., 549, 851.  
 Levêque, P. F., 569.  
 Lewin, K. R., 800.  
 Lewis, A. D., 482.  
 Lewis, A. G., 600.  
 Lewis, C. D., 899.  
 Lewis, C. L., 638, 639.  
 Lewis, D. E., 900.  
 Lewis, E. J., 199.  
 Lewis, H. G., 119, 212, 322, 615, 810.  
 Lewis, H. R., 176.  
 Lewis, I. M., 610.  
 Lewis, J. H., 578.  
 Lewis, N. P., 390.  
 Lewis, P. A., 580.  
 Lewis, R. G., 48.  
 Lewis, W. S., 372.  
 Lewkowitsch, J., 507.  
 Lhettler, A., 480.  
 Lhautard, A. F., 876.  
 Libby, H. C., 97.  
 Lichtenfeld, 658.  
 Liénaux, 576.  
  
 Lignères, J., 576.  
 Lima, A. R., 300.  
 Linch, C., 185, 187.  
 Lindabury, R. V., 799.  
 Lindemann, E. A., 82.  
 Lindemuth, J. R., 28.  
 Linden, (Countess) von, 513.  
 Lindet, 256.  
 Lindet, L., 714.  
 Lindner, 763.  
 Lindner, M., 749.  
 Lindner, P., 711.  
 Lindsey, J. R., 467, 667, 671.  
 Linklater, W. A., 294, 494.  
 Linmanleml, W. M., 553.  
 Lint, H. C., 155, 217, 513.  
 Linton, J., 566.  
 Lipman, C. B., 218, 219, 235, 499, 621.  
 Lipman, J. G., 45, 127, 129, 130, 132, 138, 140, 499, 621, 622, 632.  
 Lipp, C. C., 185.  
 Lippincott, W. A., 179.  
 List, G. M., 548, 651.  
 Lister, A. B., 199.  
 Little, A. D., 839.  
 Little, C. C., 466.  
 Littlewood, W., 275.  
 Livingston, A. E., 476, 564.  
 Livingston, B. E., 31, 621, 721.  
 Livingston, C. D., 98.  
 Livingston, E. B., 603.  
 Livingston, G., 598.  
 Lloyd, F. E., 429.  
 Lloyd, J. H., 495.  
 Lloyd, J. W., 532.  
 Lloyd, L. L., 11.  
 Lloyd, O. G., 193, 792.  
 Lloyd, S. J., 118.  
 Lloyd, W. E., 377, 513.  
 Lloyd-Jones, O., 466.  
 Lob, W., 803.  
 Lochhead, W., 250.  
 Locke, S. B., 641.  
 Lockett, W. T., 888.  
 Lockhart, A., 292.  
 Loey, W. A., 263.  
 Loch, J., 730.  
 Loeb, G. W., 88.  
 Loevenhart, A. S., 370.  
 Loew, O., 766.  
 Loewy, A., 165.  
 Löffler, W., 777, 778.  
 Loft, H. L. S., 470.  
 Lohman, C., 489.  
 Lohnis, 77.  
 Löhnis, F., 499.  
 Long, C. M., 97.  
 Long, D. D., 120, 211, 325, 417.  
 Long, E. R., 34, 130, 730.  
 Long, J. H., 805.  
 Long, W. H., 354, 441, 448.

- Lang, W. S., 311.  
 Longstreth, T. M., 418.  
 Losee, J. R., 577.  
 Lotbe, H., 481, 675.  
 Loughlin, G. P., 221.  
 Loughbridge, R. H., 324.  
 Lounsberry, C., 119, 215, 322, 617, 717.  
 Lounsberry, F. C., 270.  
 Low, T. C., 29.  
 Lowary, R. C., 286.  
 Lowenstein, A., 312.  
 Lowenstein, E., 580.  
 Lubimenko, V., 33.  
 Lubs, H. A., 136.  
 Lucas, J. E., 873.  
 Lucas, P. S., 497.  
 Lucke, R., 467.  
 Ludwick, E. E., 390.  
 Ludwig, C. A., 539.  
 Lugt, C. S., 743.  
 Lühling, A., 769.  
 Lukács, A., 575.  
 Lumia, C., 219.  
 Lumsden, L. L., 88.  
 Lund, A. V., 874, 875.  
 Lundeckrdh, H., 620.  
 Lundgren, L., 46.  
 Longe, G., 711.  
 Lurie, A., 900.  
 Luschnka, 332.  
 Lushington, A. W., 837.  
 Lushington, P. M., 837.  
 Lusk, G., 67.  
 Lüstner, G., 748.  
 Lutus, F. M., 896.  
 Lye, O. G., 885.  
 Lyle, G., 453.  
 Lyle, W. G., 112.  
 Lyman, G. R., 645.  
 Lyman, H., 508, 614.  
 Lynch, R. L., 152.  
 Lynde, H. M., 585, 885.  
 Lyne, R. N., 697.  
 Lyon, G. J., 84.  
 Lyon, T. L., 321, 499.  
 Maass, C., 576.  
 Meadis, A., 319, 500, 715.  
 Macallum, A. B., 561.  
 Macallum, A. F., 890.  
 McBride, V. R., 95, 204.  
 McCall, A. G., 496, 703, 817.  
 McCall, J., 100.  
 McCall, J. S. J., 227.  
 McCall, M. A., 798.  
 McCarthy, C. D., 837.  
 McCarthy, P. N., 312.  
 MacCaughy, V., 345, 537.  
 McClellan, W. H., 851.  
 McClelland, C. K., 138, 139, 174.  
 McClelland, J. F., 167, 525.  
 McCintock, J. A., 244, 245.  
 McCulloch, J. W., 63, 66, 363, 529.  
 McCollum, E. V., 367, 368, 400.  
 McConnel, J. W., 227.  
 McConnell, C. M., 895.  
 McConnell, W. R., 254, 656.  
 McCool, M. M., 419, 721.  
 McCord, C. P., 675.  
 McCready, S. B., 98, 196.  
 McCulloch, L., 858.  
 McDaniel, A. B., 484, 889.  
 MacDonald, G. B., 153, 743, 838.  
 MacDonald, J. R., 566.  
 McDonald, M. C., 97.  
 McDonnell, H. B., 566.  
 McDougal, D. T., 33, 430.  
 McDougall, R. S., 652.  
 MacDowell, C. H., 29.  
 MacDowell, R. F., 88.  
 McEachran, J. F., 581.  
 McEwen, G. F., 615.  
 McFadyean, J., 575.  
 McFarland, J. H., 345.  
 MacFarlane, J. J., 43.  
 MacFarlane, W., 296, 348.  
 McGeorge, W. T., 421.  
 McGill, A., 490.  
 McGowan, J. P., 383.  
 McGowan, S., 167.  
 McGregor, H. H., 558.  
 McGuire, P. F., 473.  
 McHargue, J. S., 503, 683, 802.  
 McHatton, T. H., 435, 436.  
 Machens, A., 265.  
 McIndoo, N. E., 254, 768.  
 MacIntire, W. H., 28, 128, 131, 132.  
 Mack, W. B., 188, 189.  
 McKay, A. W., 534.  
 McKay, M. B., 497, 845.  
 McKee, J. M., 321.  
 McKee, R., 139, 827.  
 Mackenna, J., 262.  
 McKenzie, H. E., 538, 838.  
 McKenzie, R. T., 261.  
 McKerral, A. C., 227.  
 McKibben, J. A., 699.  
 Mackinnon, E., 247, 845, 846.  
 Mackintosh, J., 269, 299.  
 Macklin, T., 381.  
 McLachlan, A., 434.  
 McLean, F. C., 507.  
 McLean, H. C., 127, 129, 130, 132, 140, 621, 622, 632.  
 McLean, J. A., 96.  
 MacLeau, R. M., 505.  
 McLendon, C. A., 497.  
 McLendon, W. E., 321.  
 McLennan, K., 221.  
 MacLeod, N. J., 792.  
 McMullan, F. R., 787.  
 Macmillan, H. F., 741.  
 MacMillan, H. R., 238.  
 McMullen, G. B., 240.  
 McMullen, G. W., 240.  
 McNeal, D., 615.  
 MacNeal, W. J., 488.  
 McNutt, J. C., 86.  
 McOmie, A. M., 396.  
 Macoun, W. T., 40, 439.  
 MacPherson, D., 299.  
 McRae, W., 643.  
 McVean, J. D., 296, 590.  
 McWhorter, J. W., 900.  
 Madison, H. M., 265.  
 Magarschak, B., 572.  
 Maggio, C., 580.  
 Magnus, W., 56, 249, 557.  
 Magoon, C. A., 790.  
 Malden, J. H., 742.  
 Mallard, L. C., 708.  
 Mainland, J., 588.  
 Maitland, T. D., 545.  
 Makin, C. H., 73.  
 Malby, R. A., 45.  
 Maide, O. G., 851.  
 Malden, W. J., 299.  
 Mallison, H., 709, 710.  
 Malloch, J. R., 654.  
 Mally, F. W., 437.  
 Malony, E. A., 586.  
 Malpeaux, L., 24, 38, 873.  
 Malte, M. O., 34.  
 Malthouse, G. T., 844.  
 Mamell, E., 825.  
 Manderville, L., 690.  
 Maney, T. J., 234.  
 Mangano, G., 227.  
 Mangham, S., 729.  
 Mangum, A. W., 321.  
 Manicardi, C., 427.  
 Mann, C. J., 322.  
 Mann, W. M., 556.  
 Manning, D. F., 117, 614.  
 Manning, W. H., 639.  
 Manna, T. F., 150.  
 Manoloff, E. O., 459.  
 Mansfield, G. R., 220.  
 Marcarelli, B., 435, 531, 810.  
 Marchal, P., 551, 851.  
 Marchand, R. W., 498.  
 Marcis, A., 81.  
 Marcolongo, L., 333.  
 Marcovitch, S., 450.  
 Marden, J. W., 66, 803.  
 Mare Norris, F. de la, 255.  
 Marek, J., 782.  
 Marescalchi, A., 234.  
 Marls, P. V., 296.  
 Markarian, H., 584.  
 Markham, E. A., 860.  
 Markie, D. L., 488.  
 Marsden, E., 839.  
 Marshall, C. J., 185.  
 Marshall, E. S., 727.  
 Marshall, F. R., 305, 372, 566.  
 Marshall, J. D., 493.  
 Marshall, J. T. W., 112.  
 Marshall, R. B., 84, 284.

- Martin, 348.  
 Martin, G., 801.  
 Martin, G. W., 146, 157.  
 Martin, J. G., 338.  
 Martin, J. N., 824.  
 Martin, K., 710.  
 Martin, L. H., 149.  
 Martin, W. R. M., 880.  
 Martiny, B., 589.  
 Marvin, C. F., 414.  
 Mason, D. T., 441.  
 Mason, F. C., 278.  
 Mason, S. C., 43.  
 Masoni, G., 720.  
 Masse, G., 100, 543, 743.  
 Matheson, R., 363, 656, 756.  
 Mathews, A. P., 607.  
 Mathews, J. W., 789.  
 Mathewson, G. H., 891.  
 Matson, G. C., 124.  
 Matsui, J., 877.  
 Matthews, A. H. H., 289.  
 Mattoon, W. R., 46, 346.  
 Maurer, J., 614.  
 Maury, S. W., 257.  
 Mausberg, A., 517.  
 Maxon, E. T., 123, 213, 718.  
 Maxson, A. C., 357.  
 Maxwell, L. A. I., 270, 862.  
 Mayes, W., 838.  
 Maynard, G. B., 321, 617.  
 Maynard, S. T., 439.  
 Mayné, R., 851.  
 Mayo, N. S., 292.  
 Mazé, P., 525, 827.  
 Mead, E., 690.  
 Meeker, R. A., 890.  
 Meeking, E., 739.  
 Meinecke, E. P., 849.  
 Melander, A. L., 460, 551.  
 Melchers, L. E., 349, 642.  
 Meldrum, R., 201, 202.  
 Melhus, I. E., 154, 155, 246, 396.  
 Mellana, E., 9.  
 Mellanby, J., 257.  
 Mello Geruldes, C. de, 227.  
 Melvin, A. D., 273, 306, 575.  
 Mena, J. C. y., 307.  
 Mendel, G., 500.  
 Mendel, L. B., 562, 762, 862.  
 Mendenhall, B. W., 460.  
 Mendonca, H. J. M. de, 391.  
 Mengel, C. W., 885.  
 Menzies, A. W. C., 312.  
 Mercer, L., 743.  
 Merrill, L. A., 576, 876.  
 Merrill, G. B., 753.  
 Merrill, J. H., 452, 758.  
 Merrill, J. L., 318, 509.  
 Merrill, L. A., 695.  
 Merrill, M. C., 825, 828.  
 Mertz, W. M., 36.  
 Messner, H., 575.  
 Metcalf, C. L., 361.  
 Metcalf, H., 354.  
 Metcalf, L., 886.  
 Metcalf, M. L., 395.  
 Metcalf, R., 91.  
 Mettam, A. E., 575.  
 Metzger, A. H., 347.  
 Metzger, J. E., 793.  
 Meurs, G. J. van, 113.  
 Meyer, A. H., 211, 212, 322, 617, 717.  
 Meyer, D., 725, 767.  
 Meyer, F. N., 336, 827.  
 Meyer, G. P., 862.  
 Meyer, K. F., 273, 276, 278, 384, 385, 479, 575, 782.  
 Meyer, L. F., 460.  
 Mezzadrell, C., 37, 38.  
 Michaud, B., 890.  
 Michaud, G., 414, 817.  
 Middlebrooke, W. J., 233.  
 Middleton, M. S., 438.  
 Middleton, T. H., 90, 298.  
 Mig, W., 709, 710.  
 Miessner, 575.  
 Miessner, H., 576.  
 Millam, A. B., 661.  
 Milburn, T., 794.  
 Millar, C. E., 10.  
 Millar, W. N., 641.  
 Miller, A. W., 185.  
 Miller, C., 144.  
 Miller, C. E., 295.  
 Miller, E. A., 292.  
 Miller, F. A., 18.  
 Miller, H. C., 483.  
 Miller, J. A., 70.  
 Miller, M. F., 326, 516.  
 Miller, R. C., 558.  
 Miller, R. F., 174.  
 Miller, R. J., 659.  
 Miller, R. W., 295.  
 Miller, T. S., 595.  
 Miller, W., 536.  
 Miller, W. F., 380.  
 Miliken, F. B., 158.  
 Milne, A. S., 777.  
 Milne, D., 531.  
 Milner (Viscount), 100.  
 Milner, R. D., 369.  
 Milroy, T. H., 260, 380, 611.  
 Minear, S. A., 73.  
 Miranda, J. C., 426.  
 Mitchell, A. P., 677.  
 Mitchell, C. W., 381.  
 Mitchell, H. H., 557.  
 Mitchell, O. W. H., 256.  
 Mitchell, R. V., 178.  
 Mitscherlich, E. A., 499.  
 Mitzman, M. B., 359, 856.  
 Mix, A. J., 199.  
 Miyake, I., 242.  
 Miyake, K., 31.  
 Moffatt, A. A., 26.  
 Mohler, J. R., 184, 185, 273, 385, 677.  
 Mohlman, F. W., 591.  
 Molevshetskii, S. A., 341, 652.  
 Molér, T., 627.  
 Molisch, H., 31.  
 Mollard, M., 218.  
 Molz, E., 65.  
 Montague, P. D., 55.  
 Monteiro de Mendonca, H. J., 391.  
 Montgomery, C. W., 520.  
 Montgomery, J. A., 66.  
 Montgomery, R. E., 576.  
 Monticelli, F., 63.  
 Moody, F. B., 741, 742.  
 Mooers, C. A., 323, 499.  
 Moorij, W. C., Jr., 12, 113.  
 Moonaw, C. W., 149.  
 Mooney, C. N., 124, 211, 321, 717, 810.  
 Moore, B., 308, 537, 641.  
 Moore, J. C., 344, 841.  
 Moore, P., 769.  
 Moore, R. A., 431.  
 Moore, V. A., 184, 185, 274, 383.  
 Moore, W. H., 759.  
 Moormann, 751.  
 Moraczewski, W. von, 582.  
 Mordberg, L. K., 52.  
 More, C. T., 737.  
 Moreau (Mme.) F., 526.  
 Morgan, D. T., 595.  
 Morgan, G. T., 822.  
 Morgan, H. A., 895.  
 Morgan, J. D., 97.  
 Morgan, T. H., 500.  
 Morgen, 565.  
 Morgen, A., 366, 766.  
 Morley, C., 657.  
 Morpurgo, G., 659.  
 Morrill, A. W., 232.  
 Morrison, F. B., 261, 400.  
 Morrison, J. D., 250.  
 Morrison, T. M., 211, 321.  
 Morse, F. W., 622.  
 Morse, W. J., 435.  
 Mosely, J. S., 669.  
 Mosier, J. G., 15.  
 Mostman, 298.  
 Mosseri, V. M., 227.  
 Moussa, 365.  
 Moussu, G., 575.  
 Mowry, H. H., 587.  
 Moynette, G. F., 357, 495, 695.  
 Muckleston, H. B., 80.  
 Mulford, F. L., 345.  
 Muller, F., 22.  
 Müller, G., 756.  
 Müller, M., 277.  
 Müller, R., 459.  
 Müller-Thurgau, H., 352.  
 Mulraj, 837.  
 Munsow, F. W., 440.  
 Mumford, H. W., 305, 398.  
 Münch, 514.  
 Muncie, J. H., 746.  
 Munerath, O., 37, 38.

- Mueller, T. T., 440.  
Munn, M. T., 199.  
Munus, K. N., 413.  
Munro, R. W., 34.  
Munsell, W. A., 275.  
Müntz, A., 512.  
Murphy, H. S., 195.  
Murphy, D. W., 86.  
Marschauser, H., 260.  
Muschack, F. L., 617.  
Muselman, H. H., 498.  
Musso, L. A., 623.  
Mutschler, A. J., 556.  
Mutteliet, C. F., 205.  
Muttikowski, R. A., 651.  
Myer, D. S., 496, 541.  
Myers, C. E., 146, 636.  
Myers, M. A., 793.
- Nachtshelm, H., 629.  
Nachtweh, A., 788, 891.  
Nagel, I., 824.  
Nagasaki, S., 807.  
Nakamura, A., 118.  
Nathusius, von, 100.  
Natho, J. P. J., 630.  
Nauhe, E. B., 488.  
Naumann, A., 749.  
Niel, W. J., 268.  
Needham, J. G., 692.  
Neger, F. W., 523, 744.  
Nero, L., 480.  
Nebitz, R. E., 797.  
Nelson, J. A., 98.  
Nellis, J. C., 153.  
Nelson, B. F., 798.  
Nelson, C. J. N., 897.  
Nelson, E. C., 489.  
Nelson, F. O., 885.  
Nelson, J., 798.  
Nelson, J. A., 362.  
Nelson, J. M., 408, 710, 803.  
Nelson, J. W., 120, 214, 322, 617.  
Nelson, R. A., 557.  
Nelson, V. E., 261.  
Nelson, W. L., 892.  
Nesbitt, C. T., 764.  
Neumann, M. P., 660.  
Neremanna, L., 575, 781.  
Newell, F. H., 482.  
Newman, W., 400, 449.  
Newman, C. C., 634.  
Nicholls, W. D., 571.  
Nichols, E. S., 614.  
Nicholson, J. F., 198.  
Niveler, T. W., 198.  
Nivoll, W., 576.  
Nida, W. L., 196.  
Nieberle, 575.  
Nitzman, A., 763.  
Nighbert, E. M., 184.  
Nikewski, Z., 893.  
Nikolitch, M., 85.  
Niles, H., 206.  
Nire, C. F., 233.
- Njaa, J. L., 518.  
Noel-Paton, F., 227.  
Neer, O. J., 215, 322.  
Nohara, S., 823.  
Nolan, T. J., 709, 710.  
Noll, C. F., 124, 128, 139, 143.  
Nollau, E. H., 96, 871.  
Norecross, C. A., 899.  
Nürgaard, V. A., 477.  
Norris, F. de la M., 255.  
Northrup, J. H., 710.  
Norton, J. B., 41.  
Nostitz, A. von, 215.  
Nothmann-Zuckerkindl, H., 333.  
Novelli, N., 36, 61, 72, 460.  
Novouspenski, S. P., 846.  
Nowak, C. A., 318.  
Nowell, W., 249, 455, 545, 746, 843.  
Noyes, H. A., 513.  
Nunnick, F. C., 490.  
Nuttall, G. H. F., 276, 857.  
Nuttall, W. H., 449.  
Nutter, J. W., 581.  
Nystedt, S., 575.  
Nystrom, A. B., 269, 774, 777, 789.
- Oberstein, O., 454.  
Obiedoff, S., 234.  
Oesper, R. E., 801.  
Oetken, F., 164.  
O'Gara, P. J., 340, 644, 845, 846.  
Okada, S., 463.  
Okey, C. W., 283, 585.  
Olaru, D., 31.  
Olds, R. E., 797.  
Oley, W. W., 97, 296.  
Oliver, E. W., 777.  
Olney, R., 487.  
Olson, O., 142.  
Olt, A., 576, 769.  
O'Neal, A. M., jr., 210, 321, 717.  
Onor, R., 227.  
Orinhood, C. H., 322.  
Orfield, M. N., 594.  
Ornum, J. L. van, 885.  
Orshanskaja, V., 840.  
Orton, C. R., 154, 217, 646.  
Orton, W. A., 200.  
Osborne, T. B., 562, 577, 762, 862.  
Oskamp, J., 217.  
Osman, E. G., 393.  
Osimun, A. V., 542.  
Ossat, G. de A. d., 221, 786.  
Osterhout, W. J. V., 34, 429, 730.  
Ostertag, R., 77.  
Ostertag, von, 575.  
Osterwalder, A., 226, 351, 352, 353, 354.
- Ostrander, J. E., 118, 414, 714.  
Ostwald, W., 365, 460, 801.  
Oswald, A., 803.  
Oswald, S., 24.  
Otis, S., 499.  
Owen, E. J., 146.  
Owen, I. L., 137.  
Ozlas, R. E., 312.
- Packard, W. E., 450.  
Padalka, V., 758.  
Paddock, F. B., 451, 452, 657.  
Padé, L., 473.  
Page, L. W., 390, 788.  
Page, R. W., 344.  
Page, V. W., 287.  
Pazliery, J. C., 431.  
Palge, B. H., 387, 600.  
Palge, J. B., 275.  
Paillet, A., 851.  
Palmer, A. H., 114, 118.  
Palmer, C. S., 796.  
Palmer, G. T., 70.  
Palmer, R. C., 48.  
Palmer, T. S., 157.  
Pammel, L. H., 832, 838.  
Pañganiban, E. H., 718.  
Pansset, 575.  
Pantanelli, E., 323, 650.  
Parachimonas, N., 227.  
Paraschitschuck, S., 76.  
Parker, G. L., 884.  
Parker, J. R., 255.  
Parker, S. R., 295.  
Parks, T. H., 695.  
Parreiras Horta, P. de F., 576.  
Parrish, E. M., 396.  
Parrott, P. J., 61, 62, 64, 400, 456, 653, 657.  
Parsons, S., 439.  
Parsons, T. S., 629.  
Passy, P., 533.  
Patch, E. M., 161, 550.  
Päfer, B., 43, 44.  
Paterson, A. G., 409.  
Paton, F. N., 227.  
Patrick, A. L., 617.  
Patrick, G. E., 800.  
Patten, A. J., 436.  
Patterson, A. J., 692.  
Patterson, C. T., 280, 869.  
Patton, C. A., 118.  
Paul, C. H., 880.  
Paulian, D. E., 276, 879.  
Paulsen, F., 740.  
Peacock, R. H., 510.  
Peacock, W. M., 635.  
Pearce, E. K., 654.  
Pearce, R. M., 779.  
Pearl, R., 72, 74, 470, 481, 500, 563, 564, 569, 668, 796, 829.  
Pearson, J., 890.

- Pearson, R. S., 240.  
 Pée-Laby, E., 344.  
 Peiser, K., 672.  
 Peklo, J., 845.  
 Pellew, C., 41.  
 Peltret, 261.  
 Pemberton, C. E., 59, 554, 655, 758.  
 Pérez, G. S., 491.  
 Pergande, T., 700.  
 Perkins, A. J., 25, 26.  
 Perkins, E. T., 885.  
 Perkins, S. C., 810.  
 Perkins, S. O., 124, 321, 418.  
 Perrot, E., 742.  
 Petch, T., 47, 57, 236, 649, 849.  
 Peter, A., 77.  
 Peter, A. M., 122, 683.  
 Peters, O. S., 416.  
 Peters, W. H., 267.  
 Petersen, W., 674.  
 Peterson, E. G., 497.  
 Peterson, W., 812.  
 Petherbridge, F. R., 846.  
 Pethybridge, G. H., 350, 443.  
 Petrie, J. M., 729.  
 Pettersson, O., 14.  
 Pettit, B. H., 436.  
 Pfanstiel, R., 496.  
 Pfeiffer, T., 331, 334, 724.  
 Pfeiler, W., 81, 276, 781.  
 Phalen, W. C., 28, 29.  
 Phelps, E. B., 70.  
 Phillips, A. G., 376, 569, 789.  
 Phillips, E. F., 158, 362.  
 Phillips, J. C., 564.  
 Philipotts, E., 345.  
 Philo, E. W., 528.  
 Picard, F., 851.  
 Miché, G. C., 239.  
 Pickard, A. E., 292.  
 Pickel, J. M., 203, 263, 504.  
 Pickens, E. M., 386.  
 Pickering, S. U., 199.  
 Pickering, W. H., 413.  
 Piepmeyer, B. H., 484.  
 Pierce, C. C., 850.  
 Pierce, W. D., 361, 363, 852.  
 Pieters, A. J., 824.  
 Pietsch, W., 54.  
 Pinchot, G., 297.  
 Pinkerton, T. C., 29.  
 Pinnell, W. R., 166.  
 Pinner, L., 719.  
 Piot Bey, J. B., 576.  
 Piper, C. V., 139, 338, 438.  
 Pirie, E. E., 293.  
 Pittler, H., 827.  
 Pittman, D. W., 696.  
 Plitz, W., 625.  
 Plahn-Appiani, H., 223.  
 Plaisance, G. P., 504.  
 Plasschaert, E. K., 239.  
 Platnickoff, V., 251.  
 Platt, C. B., 885.  
 Platzmann, J., 494.  
 Plowman, C. F., 856.  
 Plummer, J. K., 512.  
 Polrault, G., 851.  
 Pokschischewsky, N., 781.  
 Politis, I., 825.  
 Pomeroy, A. W. J., 756.  
 Pomeroy, C. S., 740.  
 Ponomarev, A., 83.  
 Ponscarre, L. J., 569.  
 Pontius, R. J., 681.  
 Pool, V. W., 845.  
 Poole, J. H. J., 619.  
 Popenoe, C. H., 854.  
 Popenoe, F. O., 835.  
 Popowa, N. S., 504.  
 Popp, M., 314.  
 Poppe, 578.  
 Porcher, C., 575.  
 Porchet, F., 234.  
 Porter, A. E., 579.  
 Porter, L., 258.  
 Posey, G. B., 351.  
 Post, C. B., 617.  
 Potmëkil, R., 11.  
 Potter, A. A., 444.  
 Potter, A. K., 305.  
 Potter, D., 118, 414, 714.  
 Potter, E. L., 373.  
 Potter, R. S., 112, 499, 515, 811.  
 Poulsen, V., 258.  
 Powell, A. R., 325.  
 Powell, G., 890.  
 Powell, G. H., 835.  
 Power, W. M., 576.  
 Pranke, E. J., 28, 29.  
 Pratt, B. B., 534.  
 Pratt, H. C., 254.  
 Pratt, J. H., 885.  
 Preekel, F., 807.  
 Pregl, F., 577.  
 Priantshnikov, D. N., 380.  
 Price, J. C. C., 533.  
 Prien, O. L., 678.  
 Prilleux, F., 100.  
 Prince, F. S., 531.  
 Prinsen Geerlgs, H. C., 508.  
 Pritchard, F. P., 685.  
 Pritchard, L. B., 419.  
 Pritzker, J., 776.  
 Prochaska, M., 693.  
 Profett, W. J., 566.  
 Prullt, A. H., 477.  
 Pucci, C., 864.  
 Pogliese, A., 225, 459.  
 Pulg y Natllno, J., 630.  
 Pulling, H. E., 721.  
 Purrington, C. O., 639.  
 Purves, J. M., 743.  
 Purvis, J. E., 272.  
 Putnam, G. E., 469.  
 Qualintance, A. L., 64.  
 Quantz, E., 389.  
 Quayle, H. J., 255.  
 Quinn, E. J., 120, 322.  
 Quiros, E. L., 806.  
 Quisenberry, T. E., 280, 500.  
 Rabak, F., 808.  
 Rabaté, E., 544, 748.  
 Rabinovitch, D. M., 135.  
 Raebiger, H., 80.  
 Rafn, J., 440.  
 Ragsdale, A. C., 88.  
 Ragsdale, E., 600.  
 Railliet, A., 576, 780.  
 Ram Ayyar, C. S., 711.  
 Rambaud, B., 391.  
 Ramirez, R. de C. y, 879.  
 Ramsbottom, J., 254.  
 Ramsbottom, J. K., 354.  
 Ramsey, G. B., 600.  
 Ramsey, H. J., 235, 534.  
 Ramsey, R. R., 331, 332.  
 Ranck, E. M., 876.  
 Rand, F. V., 244.  
 Rundlett, G. W., 793.  
 Range, F. H., 323.  
 Rangcl, E., 52.  
 Ransom, B. H., 185, 274, 276, 309, 680, 763.  
 Rant, A., 749.  
 Ranwez, F., 745.  
 Rapalca, R., 53.  
 Rasmussen, F., 472, 696.  
 Rassow, B., 327.  
 Rather, J. B., 13.  
 Rätz, S. von, 575.  
 Rau, P., 65.  
 Rautmann, 565.  
 Ravaz, L., 234, 548, 544.  
 Rawl, B. H., 305.  
 Rawson, H. E., 237.  
 Rayleigh (Lord), 414.  
 Reader, G., 615.  
 Readey, J. C., 493.  
 Records, E., 189.  
 Reddick, D., 248, 733.  
 Redfield, H. W., 284.  
 Reed, C. A., 740.  
 Reed, G. R., 32, 524.  
 Reed, H. S., 32, 54.  
 Reed, O. E., 472.  
 Reed, T. C., 496.  
 Reed, W. G., 117, 414.  
 Reed, W. V., 851.  
 Reek, W. R., 98.  
 Recker, H., 494.  
 Reepen, H. von B., 362.  
 Rees, C. C., 348.  
 Rees, H. L., 95, 446, 494.  
 Reeve, C. S., 318.  
 Reeves, T. B., 264.  
 Regan, W. M., 396.  
 Regnault, J., 864.  
 Regnier, G., 575.  
 Rehder, A., 435.  
 Rehuss, M. F., 663, 862.  
 Reichel, J., 184, 273, 357.  
 Reichert, E. T., 111.  
 Reid, H. W., 616.  
 Reid, W. H., 275.  
 Reijndst, A. E., 835.  
 Reijnvaan, J. van L., 549.  
 Reijnvaan, W. van L., 548.  
 Reinking, O. A., 589.

- Reilmair, O., 622.  
Remmelts, H., 575.  
Remschel, C., 482.  
Remy, T., 24, 499.  
Reppin, H., 805.  
Rettie, T., 675.  
Reuss, 321.  
Reuss, H., 530.  
Rew, R. H., 89, 298.  
Reymond, R. du B., 261.  
Reynolds, J. D., 98.  
Reynolds, M. H., 188.  
Rhea, L. J., 480.  
Rhodes, E. L., 396.  
Rial, W. P., 849.  
Rice, B. E., 885.  
Rice, C. W., 600.  
Rice, J. E., 770.  
Rice, T. D., 200, 321, 322, 510.  
Richards, E. H., 423.  
Richardson, C., 291.  
Richardson, C. H., 158, 160, 358.  
Richardson, M. W., 380.  
Riebe, J. A., 67.  
Richelet, J. A., 565.  
Richmond, E. A., 456.  
Ricks, J. R., 227.  
Rideal, E. K., 208.  
Riedel, A., 365, 460.  
Rietz, H. L., 73.  
Rigg, G. B., 429, 623, 715.  
Rizzo, W. M., 2.  
Rizward, L., 835.  
Rizward, M., 65, 835.  
Ruckleben, P., 672.  
Ringer, A. L., 462.  
Riulle, Y. T., 41, 532.  
Rippen, C., 651.  
Ritch, W. T., 569.  
Ritman, G. I., 324.  
Ritzma Bos, J., 63.  
Roadhouse, C. L., 880.  
Roth, B. B., 855.  
Roth, N. S., 322, 734.  
Robbins, W. J., 495.  
Robbins, W. W., 539, 576.  
Robert, J. C., 35, 37.  
Robert, T., 730.  
Roberts, E., 73.  
Roberts, G., 620.  
Roberts, G. A., 79.  
Roberts, W., 801.  
Robertson, R. A., 29, 729.  
Robertson, R. D., 282.  
Robinson, E., 552.  
Robinson, E. A., 47.  
Robinson, G. W., 323, 513.  
Robinson, W., 649.  
Robinson, W. O., 806.  
Robson, W. L., 193.  
Rockie, W. A., 717.  
Rockwell, W. L., 284.  
Rodes, W., 822.  
Rozianko, V. N., 251.  
Roocke, A., 80.  
Roepke, W., 855.  
Rogers, A. G. L., 840.  
Rogers, C. E., 496.  
Rogers, C. G., 46.  
Rogers, F. F., 391.  
Rogers, J. M., 446.  
Rogers, J. T., 645.  
Rogers, L. A., 473, 474, 672.  
Rogers, R. F., 213, 322.  
Rohde, C., 347.  
Rohland, P., 18, 515, 816.  
Röhmman, F., 675.  
Rohrer, C. J., 686.  
Rohwer, S. A., 392, 394, 456, 557, 857.  
Rolg, J. T., 436.  
Rolf, B., 413.  
Rolf, F. M., 199, 248.  
Rolf, P. H., 833.  
Rolle, J., 671.  
Romburg, G. von, 18.  
Rommel, G. M., 305, 474.  
Rommel, W., 822.  
Roos, de, 576.  
Root, R. R., 45, 198.  
Rorer, J. B., 50, 51, 854.  
Rosa, G. F. de la, 689.  
Rosanoff, M. A., 806.  
Rose, C. M., 510.  
Rose, D. H., 30, 136.  
Rose, R. C., 243.  
Rose, R. E., 762, 767.  
Rosenbaum, J., 245, 350, 746.  
Rosenberg, J., 272.  
Rosenbusch, F., 580.  
Rosenfeld, A. H., 586.  
Rosengren, F. L., 580.  
Rosenthal, H., 505.  
Rosenthaler, L., 312.  
Ross, H. E., 571.  
Ross, R. M., 837, 848.  
Ross, W. G., 321.  
Rossi, G., 499.  
Rossi, H. J., 797.  
Rostrop, S., 765.  
Roth, P., 369.  
Rothera, A. C. H., 270.  
Rotky, K., 877.  
Rouband, E., 555.  
Rouchelmann, N., 32.  
Routly, H. T., 890.  
Roux, E., 851.  
Rovetta, R., 737.  
Rowe, P., 488.  
Roy, W. R., 391.  
Rózsa, M., 414.  
Rucker, W. C., 355.  
Rudovsky, J., 575.  
Ruediger, E. H., 876.  
Ruehle, G. L. A., 183.  
Ruggles, A. G., 448, 853.  
Ruh, H. O., 558.  
Rühle, J., 658.  
Rumbold, C., 546.  
Rummell, L. L., 199.  
Rump, E., 626.  
Runge, J., 489.  
Ruprecht, R. W., 622.  
Rusby, H. H., 822.  
Rush, J. E., 722.  
Russell, E. J., 193, 321, 326, 327, 423, 499, 514, 716.  
Russell, G. A., 407, 502, 711.  
Ruston, A. G., 299, 620.  
Rutgers, A. A. L., 57, 744.  
Rutherford, A., 652.  
Sacharov, N., 63, 65, 251.  
Sackett, C. C., 600.  
Sackett, W. G., 811.  
Safford, W. E., 336.  
Safro, V. I., 61.  
Sahasrabuddhe, D. L., 525.  
Salliard, E., 13.  
Salant, W., 381, 476.  
Salceby, N. M., 367.  
Sulkowski, E., 459.  
Salmon, C., 137.  
Salmon, E. S., 49, 241.  
Salter, R. M., 98.  
Salvadores, A. Z., 533.  
Samson, G. R., 373.  
Sanders, G. E., 255.  
Sanders, T. W., 45.  
Sauds, W. N., 227, 631.  
Sandsten, E. P., 493.  
Sandström, J. W., 614.  
Sapiro, S. T., 740.  
Sar, M. E., 809.  
Sarasin, M., 306.  
Sardy, J. B., 28, 29.  
Sargant, E., 134.  
Sargeant, J. W., 47.  
Sasscer, E. R., 251.  
Sato, M., 503, 574.  
Sato, S., 92.  
Saunders, E. R., 822.  
Saunders, P. T., 478.  
Savage, E., 535.  
Savage, E. S., 379, 400, 565, 670.  
Savage, W. G., 895.  
Savastano, L., 856.  
Saveller, F., 83.  
Savelli, M., 63, 459.  
Saville, T., 787.  
Sawidowitsch, W., 682.  
Sawyer, W. A., 69.  
Sayre, R., 502.  
Scales, F. M., 136, 611, 623.  
Scammell, H. B., 756.  
Scarborough, R. J., 212.  
Scassolanti-Sforzolini, G., 152, 227.  
Schaefer, H., 238.  
Schanz, M., 227.  
Schaumann, H., 462.  
Seibel, V., 258.  
Scheffler, F., 81, 276.  
Schellenberger, H. C., 135.  
Scheppelman, W., 496.  
Scheringa, K., 113.  
Schern, K., 185.  
Scheyer, G., 781.

- Schlemann, E., 824.  
 Schlatter, F. P., 97, 834.  
 Schlegel, M., 82.  
 Schlenvogt, J. H., 474.  
 Schlich, W., 743.  
 Schlick, W. J., 885.  
 Schmidt, F., 117.  
 Schmidt, A., 227.  
 Schmidt, C. C., 793, 897.  
 Schmidt, C. L. A., 803, 804.  
 Schmidt, H., 274.  
 Schmidt, J., 264.  
 Schmidt, O., 26.  
 Schmidt, P., 390.  
 Schmidt, P. J., 83.  
 Schmidt, R., 832.  
 Schmiedeknecht, O., 657.  
 Schneider, A., 713.  
 Schneider, C., 819.  
 Schneider, H., 33.  
 Schneidewind, W., 326.  
 Schneyer, J., 613.  
 Schöder, A., 292.  
 Schöner, J., 676, 677.  
 Schoene, W. J., 61.  
 Schoenmann, L. R., 213, 617.  
 Schoevers, T. A. C., 63.  
 Schofield, F. W., 83, 696.  
 Scholl, A., 263.  
 Schorger, A. W., 502, 607.  
 Schott, H. A., 695.  
 Schottelius, M., 164.  
 Schreiber, K., 118.  
 Schreiner, 594.  
 Schreiner, J. F., 857.  
 Schreiner, O., 20, 31, 499.  
 Schreuder, P. J. van der, 268.  
 Schröder, D., 65.  
 Schroeder, E. C., 581.  
 Schroeder, H., 31.  
 Schroeder, J., 15.  
 Schultz, 650.  
 Schulze, B., 37, 327.  
 Schulze, P., 863.  
 Schumacher, I. C., 783.  
 Schumann, C. L., 607.  
 Schuster, F., 494.  
 Schutte, W. M., 683.  
 Schütz, W., 878.  
 Schwangart, E., 553.  
 Se'wappach, 837.  
 Seabates, D., 892.  
 Seefeld, C. S., 529.  
 Seefeld, F. A., 94.  
 Seotland, D. W., 512.  
 Scott, E., 213, 322.  
 Scott, E. W., 60.  
 Scott, J. M., 831.  
 Scott, J. W., 384, 489, 658.  
 Scott, R. W., Jr., 434.  
 Scott, W. M., 61, 250.  
 Scott, W. W., 203.  
 Seovell, M. A., 694.  
 Seoville, G. P., 791.  
 Searle, G. O., 52.  
 Seaver, F. J., 56.  
 Secrest, E., 639.  
 Seel, E., 365.  
 Seeley, D. A., 714.  
 Seelhorst, C. von, 17.  
 Séguin, P., 878.  
 Seibold, E., 80.  
 Seldenberg, A., 206.  
 Selby, A. D., 444.  
 Selecter, I., 313.  
 Sell, E. S., 94.  
 Sell, R. A., 656.  
 Sellards, E. H., 28, 29, 724, 821.  
 Semichon, L., 50, 243, 653.  
 Sea, S. K., 756.  
 Senni, L., 440.  
 Serbinov, I. L., 846.  
 Sergeant, E., 480, 854.  
 Setchell, W. A., 32.  
 Severin, H. C., 360.  
 Severin, H. H. P., 360.  
 Severson, B. O., 171, 174, 175.  
 Sewell, M. C., 295.  
 Seyboth, R., 118.  
 Seydelhelm, R., 280.  
 Seymour, E. L. D., 635.  
 Seymour, H. C., 296.  
 Sforzolini, G. S., 152.  
 Shafer, G. D., 252.  
 Shamel, A. D., 43, 639, 835.  
 Shannon, R. C., 358, 554.  
 Shantz, H. L., 226, 306, 522.  
 Shapirovalov, M., 496.  
 Sharples, A., 448.  
 Sharples, P. P., 684.  
 Shattuck, C. P., 881.  
 Shaw, A. M., 811.  
 Shaw, C. F., 321.  
 Shaw, F. C., 900.  
 Shaw, F. J. F., 49.  
 Shaw, R. H., 713.  
 Shaw, T. W. A., 10.  
 Shaw, W. N., 319, 413.  
 Shear, C. L., 42, 300, 448, 539, 848.  
 Sheather, A. L., 575.  
 Shedd, C. G., 499.  
 Shedd, O. M., 428.  
 Shelton, L., 238.  
 Shembel, S., 842.  
 Shepard, E. H., 438.  
 Shepherd, F. R., 539.  
 Sheppard, E. P., 899.  
 Sherbakoff, C. D., 540.  
 Sherman, F., Jr., 251, 548.  
 Sherman, W. A., 149, 340.  
 Shermald, A. E., 501.  
 Sherwin, C. P., 763, 863.  
 Sherwin, W. E., 885.  
 Sherwood, C. M., 285, 286.  
 Shiffer, C. W., 212, 810.  
 Shipley, A. E., 251.  
 Shishkin, K., 361.  
 Shive, J. W., 333.  
 Shoemith, V. M., 723, 735.  
 Sholl, L. H., 341.  
 Shoop, C. F., 485.  
 Shoup (Mrs.), G. R., 494, 669, 694, 770, 798.  
 Show, S. B., 441.  
 Shreder, R., 337.  
 Shreve, E. B., 728.  
 Shrewsbury, H. S., 262.  
 Shrock, M. S., 497.  
 Shcherbakov, T., 454.  
 Shufeldt, R. W., 751.  
 Shull, C. A., 32.  
 Shull, G. H., 500.  
 Shulov, L., 135.  
 Shvetsov, K. N., 330.  
 Sicard, L., 711.  
 Sichmann, O., 805.  
 Siefert, 537.  
 Siegfried, M., 803.  
 Siegler, E. A., 497.  
 Siegler, E. H., 60.  
 Sievers, A. F., 237.  
 Sigmond, A. A. F. de, 499.  
 Siler, J. P., 488.  
 Silva Barrios, F. A., 572.  
 Simmermacher, W., 331, 334.  
 Simpson, G. C., 413.  
 Simpson, G. M., 509.  
 Simpson, S., 227, 848.  
 Sims, C. E., 87, 685.  
 Sinclair, J. F., 859.  
 Sirks, M. J., 823.  
 Sisson, S., 450.  
 Sitenský, F., 491.  
 Sittig, 782.  
 Skinner, J. J., 20, 31, 815.  
 Skinner, L. T., 322, 511, 717.  
 Sladen, F. W. L., 556.  
 Slater, M. E., 412.  
 Slocum, R. R., 268.  
 Small, J., 727.  
 Small, J. H., 885.  
 Small, W., 540, 848.  
 Smalley, B. E., 600.  
 Smies, E. H., 211, 212, 322, 717.  
 Smith, A. Z., 600.  
 Smith, C. A., 659.  
 Smith, C. D., 306.  
 Smith, C. O., 545, 749.  
 Smith, C. W., 211.  
 Smith, E., 437, 438, 637.  
 Smith, E. F., 49, 300, 442.  
 Smith, E. H., 240, 333, 648.  
 Smith, F. A. C., 660.  
 Smith, F. H., 440.  
 Smith, G., 52.  
 Smith, G. H., 278, 674.  
 Smith, G. P. D., 247, 541, 644, 745, 843, 845, 848, 848.  
 Smith, H., 490.  
 Smith, H. C., 210, 321.  
 Smith, H. E., 64, 159.  
 Smith, H. H., 491.  
 Smith, H. S., 64, 361, 451.  
 Smith, H. W., 693.  
 Smith, J., 319.  
 Smith, J. L., 675.

- Smith, J. W., 118, 308, 418,  
601, 603.  
Smith, K., 640.  
Smith, L. B., 657.  
Smith, O. H., 193.  
Smith, P. H., 467.  
Smith, P. T., 640.  
Smith, R. A., sr., 238.  
Smith, R. E., 349, 645.  
Smith, R. G., 218, 499.  
Smith, R. O., 695.  
Smith, T., 478, 498, 581.  
Smith, T. O., 163, 521.  
Smith, W. G., 299, 322.  
Smith, W. V., 582.  
Smith, W. W., 195.  
Smithwick, H. W., 151.  
Smolák, J., 648.  
Smith, E. G., 752.  
Snell, J. F., 807.  
Snowden, J. H., 895.  
Snyder, F. B., 798.  
Snyder, J. M., 119, 210, 418.  
Snyder, R. S., 112, 490, 515,  
811.  
Snyder, T. E., 754.  
Sobbe, O. von, 317, 612.  
Söderbaum, H. G., 724, 726.  
Soderstrom, G. F., 67.  
Sohler, W. D., 890.  
Sokolowsky, A., 873.  
Solano, R., 299.  
Somerville, W., 298.  
Somes, M. P., 361.  
Sommerfield, K., 767.  
Sommerville, D., 762.  
Somner, P., 499, 747.  
Sorgius, H., 238.  
Sornay, P. de, 816.  
Soule, 28.  
Soule, A. M., 29, 307.  
Soule, A. M. G., 40, 76.  
Sousa e Faro, J. D. C. de,  
391.  
Southworth, W., 498.  
Spafford, R. R., 211, 212.  
Spafford, W. J., 25.  
Spahn, W. M., 211, 322.  
Spencer, W. H., 862.  
Spiegelberg, R., 83.  
Spillman, W. J., 194, 494,  
502, 792.  
Spinks, G. T., 846.  
Spino, K., 311.  
Spooler, H. A., 30.  
Spoor, J. A., 799.  
Spowers, A. A., 890.  
Sprague, F. A., 735.  
Sprague, C. B., 737.  
Sprecher, A., 639.  
Spring, F. G., 838.  
Squadrini, G., 372.  
Squire, S. L., 890.  
Stack, J. P., 322.  
Stadler, H., 10.  
Stabel, G., 847.  
Stahl, C. L., 487.  
Stahl, J. L., 95, 294, 494,  
694, 796.  
Stakman, E. C., 244, 300.  
Staley, L. E., 642.  
Stallings, R. E., 566.  
Standfuss, R., 82.  
Stanfield, R., 84.  
Stange, C. H., 82, 387.  
Stanton, T. R., 733.  
Stapleton, M. F., 569.  
Stapp, G. M., 861.  
Steenbock, H., 261, 570.  
Steeves, R. P., 93.  
Steffen, M. R., 478.  
Steldtmann, E., 86.  
Stein, M. F., 399.  
Steiner, A. M., 489.  
Steinkoenig, L. A., 323.  
Steinmetz, C. P., 28.  
Seizenmuller, G. V., 838.  
Stemple, F. W., 598.  
Stepanoff, 807.  
Stern, L., 663.  
Sterrett, W. D., 346, 641,  
839.  
Stevens, E. A., 390, 484.  
Stevens, E. H., 123, 510, 718.  
Stevens, H. E., 447.  
Stevens, H. P., 227.  
Stevens, H. W., 890.  
Stevens, N. E., 848.  
Stevenson, W. H., 722.  
Stevenson, W. L., 287.  
Stewart, C. L., 392.  
Stewart, G., 598.  
Stewart, H. C., 799.  
Stewart, H. W., 396.  
Stewart, J. P., 148, 149,  
154, 160.  
Stewart, J. S., 691.  
Stewart, J. T., 618, 885.  
Stewart, M. M., 149.  
Stewart, M. N., 418.  
Stewart, R., 812.  
Stewart, R. L., 600.  
Stewart, V. B., 300, 647,  
648, 747.  
Stietzel, F., 660.  
Stiles, C. F., 96.  
Stiles, C. W., 88.  
Stiles, W., 731.  
Stockdale, F. A., 227, 434,  
843.  
Stocking, W. A., 874.  
Stockman, S., 382, 575.  
Stok, J. P. van der, 614.  
Stoklassa, J., 760.  
Stone, A. L., 143, 832.  
Stone, R. L., 877.  
Stone, R. P., 382.  
Stone, R. W., 329.  
Stone, W. E., 697.  
Stokey, E. B., 95, 294, 418,  
494, 604, 736, 796.  
Storey, F. B., 884.  
Störmer, C., 413.  
Stort, C. G. J. A. van G.,  
893.  
Story, G. F., 96.  
Stout, A. B., 335.  
Stover, A. J., 66.  
Stoward, F., 654.  
Straczewski, H., 168.  
Straborn, A. T., 322.  
Stranek, F., 349.  
Strauss, H., 531, 579.  
Strauss, O., 104.  
Street, J. P., 311, 458, 520.  
Street, P. W., 767.  
Strickland, E. H., 250, 358.  
Ströse, A., 576.  
Stroud, J. F., 615.  
Strowd, W. H., 134.  
Stuart, A. T., 218.  
Stubblefield, B. M., 695.  
Stuckey, H. P., 151.  
Studhalter, R. A., 56, 448,  
545, 853.  
Stuessy, S., 659.  
Stupart, R. F., 208.  
Stutzer, A., 200, 314, 328,  
565, 609, 813.  
Suarez, J. L., 306.  
Suckow, E., 576.  
Sudworth, G. B., 742.  
Suglura, K., 112.  
Sullivan, J. E., 690.  
Sullivan, K. C., 97.  
Summer, F. D., 370.  
Surface, F. M., 481, 829.  
Süring, R., 13.  
Suschkina-Popowa, N., 564.  
Sutton, L. F., 637.  
Sutton, M. H. F., 223, 821.  
Svoboda, H., 762.  
Swain, E. H. F., 743.  
Swaine, J. M., 250, 857.  
Swanger, D. G., 199.  
Swann, W. F. G., 414.  
Swanson, A. A., 410.  
Swanson, C. O., 516.  
Sweet, A. T., 321, 322, 417,  
511.  
Sweet, G., 582.  
Sweuk, M. H., 57.  
Swezey, O. H., 548, 554, 556.  
Swingle, L., 495.  
Swingle, W. T., 235, 529.  
Sydenstricker, E., 259.  
Symeonides, P., 339.  
Symes, W. L., 476.  
Szartorisz, B., 35.  
Szplman, J., 575.  
Taber, L. J., 895.  
Tachau, L. L., 257.  
Tacke, 327.  
Tacke, B., 564.  
Tadokoro, T., 312.  
Tackle, J. V., 672.  
Talbot, A. N., 685.  
Talbot, C., 890.  
Talbot, F. B., 861.

- Talman, C. F., 615.  
 Tammes, T., 629.  
 Tanner, P. A., 487.  
 Tarasov, P. K., 314.  
 Tarchetti, A., 686.  
 Tarman, G. C., 595.  
 Tartar, H. V., 548.  
 Taubenhaus, J. J., 156, 242, 396, 747.  
 Taudevin, C. H., 44.  
 Tavares, J. S., 856.  
 Taverner, N. J. A., 407.  
 Taylor, A. E., 322, 418, 510, 578, 617.  
 Taylor, E., 686.  
 Taylor, E. P., 695.  
 Taylor, F. R., 568.  
 Taylor, F. W., 531.  
 Taylor, G. L., 117, 118.  
 Taylor, H. C., 288.  
 Taylor, H. V., 497.  
 Taylor, K., 383.  
 Taylor, M. G. D., 471.  
 Taylor, O. M., 42.  
 Taylor, W. J., 275.  
 Teele, R. P., 784.  
 Teeter, T. A. H., 887.  
 Tehon, L. R., 747.  
 Tempamy, H. A., 227.  
 Tempsky, L. von, 837.  
 Ten Troeck, K., 498.  
 Ter Laag, A. M. W., 848.  
 Teruda, T., 117.  
 Terroloer, E. F., 257, 258.  
 Terry, J. R., 470.  
 Teuteu, E. van, 859.  
 Thallmayer, 891.  
 Tharp, W. E., 120, 211, 322, 510.  
 Thatchner, R. W., 201, 633.  
 Thaysen, A. C., 572.  
 Theller, A., 576.  
 Theobald, F. V., 249, 551, 651.  
 Thom, C., 51.  
 Thom, C. C., 39.  
 Thomas, B. A., 275.  
 Thomas, C. M., 485.  
 Thomas, E. M., 257.  
 Thomas, H. H., 535.  
 Thomas, J. F., 96.  
 Thomss, M. C., 199.  
 Thomas, (Mrs.) T., 45.  
 Thomas, W., 133, 821.  
 Thompson, A. L., 771.  
 Thompson, A. R., 495.  
 Thompson, C. C., 617.  
 Thompson, G. W., 98.  
 Thompson, J. G., 892.  
 Thompson, R. B., 600.  
 Thompson, S. E., 685.  
 Thompson, T. G., 508.  
 Thompson, W. C., 176, 377.  
 Thompson, W. H., 298.  
 Thompson, W. O., 298, 397.  
 Thompson, W. R., 563, 557, 751.  
 Thompson, W. S., 594.  
 Thornber, H., 436, 437, 637.  
 Thornber, J. J., 236.  
 Thorndike, E. L., 70.  
 Thorne, C. E., 499, 520, 621, 806.  
 Thornton, E. W., 661.  
 Thornton, T., 227, 844.  
 Throckmorton, R. L., 322, 820.  
 Thurgau, H. M., 352.  
 Thurston, L. A., 837.  
 Thysell, J. C., 798.  
 Tiemann, H. D., 152.  
 Tilleston, W., 563.  
 Tilley, F. W., 781.  
 Tillman, B. W., 123.  
 Tiltonson, C. R., 839.  
 Tillson, G. W., 890.  
 Tummis, R. S., 268.  
 Timpe, H., 662.  
 Tingle, A., 804.  
 Tingle, J. B., 804.  
 Tinker, F., 626.  
 Titchmarsh, C. C., 345, 833, 836.  
 Titze, 576.  
 Toan, L. A., 248.  
 Tobler, F., 194.  
 Todd, J. A., 227.  
 Tokugawa, Y., 628.  
 Tolskil, A. P., 537, 640.  
 Tomhave, W. H., 171.  
 Tommasina, C., 391.  
 Tompson, H. F., 635.  
 Topi, M., 63.  
 Tornello, F. C., 834.  
 Torossian, C., 382.  
 Torrance, F., 184.  
 Tottingham, W. E., 221.  
 Toumey, J. W., 152, 308.  
 Tower, D. C., 455.  
 Towne, W. J., 685.  
 Townsend, C. H. T., 65, 253, 355, 358, 360, 554, 565, 655, 756, 856, 858.  
 Traasen, A. E., 226.  
 Trabut, 36.  
 Trabut, L., 354.  
 Trafton, G. H., 692.  
 Tråkårdh, I., 855.  
 Traum, J., 271, 274.  
 Trego, E. A., 787.  
 Treherne, R. C., 58.  
 Trelease, F. J., 635.  
 Tretjakov, S. S. F., 230.  
 Tripp, E. H., 423.  
 Trist, M. E., 682, 779.  
 Tristan, J. F., 414, 517.  
 Troeck, K., ten, 498.  
 Troitskii, N. N., 358, 361.  
 Trolle, R. af, 574.  
 Tropea, C., 227.  
 Troup, R. S., 346, 347, 839.  
 Trowbridge, P. F., 505.  
 Troxell, E. L., 264.  
 True, A. C., 307, 609.  
 True, G. H., 262, 270.  
 True, R. H., 224, 504.  
 Truelle, A., 233, 834.  
 Trullinger, R. W., 286, 790.  
 Truog, E., 418, 504, 617.  
 Trusov, A., 516, 619.  
 Tryon, H., 543, 549.  
 Tschaplowitz, 416.  
 Tschermak, A. von, 569.  
 Teuji, K., 762.  
 Tubeuf, C. von, 750.  
 Tulaikoff, N., 499.  
 Tulaikov, N., 618.  
 Tunstall, A. S., 835.  
 Turley, A. M., 661.  
 Turner, W. F., 96, 754.  
 Turner, C., 594.  
 Tuttle, H. F., 124.  
 Twitchell, G. M., 438.  
 Tyler, E. E., 758.  
 Uchida, S., 802.  
 Udall, D. H., 289.  
 Udden, J. A., 26.  
 Udriski, G., 576.  
 Uglow, W. A., 660.  
 Uhler, W. D., 331.  
 Ulrich, F. T., 692.  
 Ulrich, 767.  
 Umeda, N., 763.  
 Underhill, F. P., 71.  
 Upsou, F. W., 111, 225.  
 Upton, H. E., 590.  
 Urbina, V. V., 196.  
 Urlich, F. W., 754, 853, 854.  
 Uspenskii, N. A., 330.  
 Utt, C. A. A., 113, 206.  
 Vail, T. N., 799.  
 Vaile, C. S., 344.  
 Valentine, E., 473.  
 Vallean, W. D., 444.  
 Vallée, H., 575.  
 Van Alstine, E., 15.  
 Vanatta, E. S., 123, 322, 616.  
 Van Dam, W., 570, 574.  
 Van den Eeckhout, A., 566.  
 Van der Goot, P., 758.  
 Van der Laan, A., 279.  
 Van der Schreuder, P. J., 268.  
 Van der Stok, J. P., 614.  
 Van Deusen, M. C., 92.  
 Van Doorn, W. T. C., 532.  
 Van Dyne, C., 213, 214, 322, 510.  
 Van Es, L., 185.  
 Van Fleet, W., 151.  
 Van Gendereu Stort, C. G. J. A., 893.  
 Van Helten, W. M., 344.  
 Van Hermann, H. A., 43, 833.  
 Van Leeuwen, J. F. H. L., 880.  
 Van Leeuwen-Reijnvaan, J., 549.  
 Van Leeuwen-Reijnvaan, W., 549.

- Van Meurs, G. J., 113.  
 Van Norman, H. E., 181, 182, 183.  
 Van Ornum, J. L., 885.  
 Van Rijn, J. J. L., 273.  
 Van Scoyoc, H. S., 890.  
 Vancell, G. H., 96.  
 Van Slyke, D. D., 505, 507, 577, 608.  
 Van Slyke, L. L., 461, 671, 708, 802.  
 Van Tentem, E., 859.  
 Van Wisselingh, C., 627, 825.  
 Vapion, W. E., 569.  
 Vargas, L. E. M., 528, 529.  
 Vassiliev, E. M., 360.  
 Vaughn, E. C., 829.  
 Vaughan, V. C., 71.  
 Vassière, P., 851.  
 Veach, J. O., 321, 322.  
 Vedder, E. B., 474.  
 Vega y Loyo, F., 300.  
 Teglia, F., 576.  
 Veldee, M. V., 272.  
 Vennerholm, J., 576.  
 Verge, G., 544.  
 Vermeulen, H. A., 576.  
 Vermorel, V., 249, 540, 745, 843.  
 Verschaffelt, E., 429, 859.  
 Verteuil, J. de, 881, 832.  
 Vezia, 851.  
 Vickers, H. A., 638, 639.  
 Vickrey, R. A., 453.  
 Viehoever, A., 11.  
 Viereck, H. L., 263.  
 Vilheira, E. J. de, 391.  
 Villard, V., 234.  
 Vilchur, M. V., 577.  
 Villèle, A. de, 665.  
 Vinall, H. N., 140, 827.  
 Vincent, C. C., 42, 738, 747.  
 Vinograd-Vilchur, M., 577.  
 Vista y Isles, T., 344.  
 Voelcker, J. A., 199, 423.  
 Vogel, J., 517.  
 Vogel von Falckenstein, K., 16.  
 Voglio, P., 456, 654.  
 Vogt, P. L., 895.  
 Volgt, A., 386.  
 Volk, W., 165.  
 Vollerisen, J. J., 312.  
 Völz, W., 471, 565.  
 Voorhees, J. F., 308.  
 Voorhees, J. H., 150, 197.  
 Vornfelde, K., 788.  
 Votoček, E., 11.  
 Vries, H. J. F. de, 713.  
 Vries, J. J. O. de, 590, 671.  
 Vries, M. S. de, 628.  
 Vries, O. de, 634.  
 Fromman, C., 791.  
 Vailliet, A., 851.  
 Vahle H. T., 458.  
 Värthelm, A., 623.  
 Vronskii, G., 536.  
 Wadsworth, J. W., 799.  
 Waggaman, W. H., 9, 328, 610.  
 Wagner, P., 631.  
 Wakefield, E. M., 546.  
 Wakeford, J. P., 488.  
 Wakeman, A. J., 562, 862.  
 Walcott, A. M., 462.  
 Waldron, L. R., 798.  
 Waldron, R. A., 157.  
 Waldrop, C. S., 119, 121, 321, 322.  
 Walker, A. C., 786.  
 Walker, B. P., 785.  
 Walker, E. D., 485.  
 Walker, E. L., 879.  
 Walker, E. M., 651.  
 Walker, F. P., 670.  
 Walker, H. B., 785.  
 Walker, H. F., 149.  
 Walker, J. T. A., 274.  
 Walker, L. S., 624.  
 Walker, R. M., 797.  
 Wall, S., 575.  
 Wallace, H., 499.  
 Wallace, H. W., 28.  
 Wallace, R., 372.  
 Waller, A. G., 97, 295, 496.  
 Walling, W. A. B., 359.  
 Walpole, 712.  
 Walpole, G. S., 579.  
 Walters, E. H., 325.  
 Walton, G. P., 608.  
 Walton, J. H., 422.  
 Walton, L. B., 370.  
 Walton, W. R., 360, 554.  
 Wapier, 743.  
 Ward, A. R., 274, 399.  
 Ward, M., 891.  
 Ward, R. DeC., 14, 413.  
 Ward, S. H., 184, 185.  
 Wardlaw, H. S. H., 271, 409.  
 Ware, J. W., 95, 796.  
 Waring, C. H., 259.  
 Warmbold, 100.  
 Warner, D. F., 770.  
 Warner, L. A., 273.  
 Warren, A., 540, 550.  
 Werren, G. F., 665.  
 Warren, W. H., 152.  
 Waterhouse, G. A., 453.  
 Waters, H. J., 305, 307, 397, 400.  
 Watkins, M. L., 599.  
 Watkins, W. L., 123, 511.  
 Watson, E. A., 186.  
 Watson, E. B., 322.  
 Watson, E. J., 496.  
 Watson, E. L., 891.  
 Watson, H. W. A., 839.  
 Watson, J. R., 358, 400.  
 Watson, M. E., 364.  
 Watson, W., 741.  
 Watt, A., 320.  
 Watt, R. D., 518.  
 Watts, F., 491, 651.  
 Watts, R. L., 340.  
 Waugh, F. A., 198.  
 Way, C., 184.  
 Waynick, D. D., 499.  
 Wayson, N. E., 355.  
 Weaver, E. R., 714.  
 Wenver, L. A., 769.  
 Weber, W., 24.  
 Webster, F. M., 200, 400, 653.  
 Webster, R. L., 357, 758.  
 Wedderburn, A., 13.  
 Weeks, C. R., 495.  
 Weeks, J. R., 614.  
 Weevers, T., 526.  
 Wehmer, C., 547.  
 Wehrlein, H., 335.  
 Wehrle, 576.  
 Wehrwein, G. S., 498.  
 Welch, 163.  
 Weldman, F. D., 364.  
 Weigmann, 687.  
 Weil, R., 778.  
 Weill, J., 257.  
 Weinberg, M., 878.  
 Weinzierl, J., 272.  
 Weir, J. R., 546, 547, 642, 649.  
 Weir, W., 516.  
 Wels, F., 814.  
 Weiss, A., 690.  
 Weiss, H. B., 355, 653.  
 Weiss, J. E., 494.  
 Weitzknecht, R. H., 640.  
 Welch, H., 174.  
 Weld, L. D. H., 392, 893.  
 Weldon, G. P., 357, 451, 526.  
 Weldon, W. F. R., 864.  
 Welker, W. H., 411.  
 Wellington, J. W., 36, 40, 41, 42.  
 Wells, A. E., 716.  
 Wells, C. A., 169.  
 Wells, H. G., 577.  
 Wells, J. M., 885.  
 Wells, S. D., 714.  
 Welton, F. A., 631.  
 Wengler, F., 510.  
 Wentworth, E. N., 400, 564.  
 Werner, H. O., 836.  
 Werner, J. C., 395.  
 Worth, A. J., 436.  
 Wessels, P. H., 426.  
 Wesson, D., 28.  
 West, F. L., 613.  
 West, H. H., 392.  
 West, R. M., 611, 798.  
 Wester, P. J., 635, 639.  
 Westerdijk, J., 48.  
 Westley, R., 96.  
 Westmattelmann, 899.  
 Weston, A. D., 89, 688.  
 Wetmore, A., 840, 850.  
 Weyland, H., 257, 472.

- Wheeler, C. S., 895.  
 Wheeler, G. A., 258.  
 Wheeler, R. N., 487.  
 Wheeler, W., 96.  
 Wheeler, W. M., 556.  
 Wheelock, C. R., 890.  
 Wheelale, M., 335.  
 Wherry, W. B., 355.  
 Whipple, W. W., 687.  
 Whipple, O. B., 736.  
 Whitchee, G. H., 793.  
 White, E. V., 289.  
 White, F. M., 499.  
 White, G. C., 98.  
 White, G. R., 777.  
 White, H. C., 139.  
 White, J. W., 131.  
 White, W. R., 125.  
 White-Haney, J., 530.  
 Whiting, J. D., 854.  
 Whitmarsh, P. L., 477.  
 Whitmarsh, R. D., 59.  
 Whitner, D. D., 766.  
 Whitner, H. B., 885.  
 Whitner, M., 321.  
 Whittsit, J. E., 509.  
 Whitson, A. R., 817.  
 Whittaker, H. A., 185.  
 Wibberley, T., 299.  
 Wickson, E. J., 114, 391.  
 Wicksteed, H. K., 240.  
 Widtsoe, J. A., 497.  
 Wiegert, E., 80.  
 Wig, R. J., 584, 685.  
 Wiggins, E. R., 891.  
 Wigglesworth, A., 227.  
 Wight, A., 489.  
 Wild, L. J., 617.  
 Wiley, H. W., 658.  
 Wiley, R. C., 624.  
 Wilkie, S. J., 723.  
 Wilkins, F. S., 96.  
 Wilkins, L. K., 127, 129,  
 130, 132, 140, 298, 621,  
 622, 632.  
 Wilkins, (Mrs.) R., 492.  
 Wilkinson, A. E., 41, 232,  
 342.  
 Wilkinson, J. B., 322.  
 Wilkinson, W. E., 210, 321.  
 Willaman, J. J., 798.  
 Willard, J. T., 624.  
 Wille, F., 242.  
 Willets, D. G., 259.  
 Williams, A. D., 684, 685,  
 686.  
 Williams, C. B., 62, 434,  
 450.  
 Williams, C. E., 830, 831,  
 863.  
 Williams, G. M., 584.  
 Williams, H. S., 440.  
 Williams, R. R., 367, 662.  
 Williams, W. L., 184, 386,  
 576.  
 Williamson, C. G., 332, 371.  
 Williamson, E. H., jr., 191.  
 Willis, F. B., 297.  
 Willis, L. G., 127.  
 Willis, R. L., 639.  
 Willis, J. G., 184, 185, 187.  
 Willson, C. A., 867.  
 Willstätter, R., 709, 710.  
 Wilson, A., 722.  
 Wilson, C. S., 600.  
 Wilson, D. W., 763.  
 Wilson, H. F., 251, 356, 548.  
 Wilson, H. M., 222.  
 Wilson, J., 689.  
 Wilson, James, 499, 799.  
 Wilson, R. N., 400.  
 Wilson, W., 298.  
 Wladiseb, K., 262.  
 Wing, J. E., 99.  
 Wing, L. W., jr., 396.  
 Winkler, L. W., 111.  
 Winkler, V., 98.  
 Winn, A. F., 449.  
 Winslow, E. A., 257.  
 Winslow, C. E. A., 70, 192.  
 Winslow, R. M., 437.  
 Winston, J. B., 52, 53, 695.  
 Winston, R. A., 321.  
 Winters, R. Y., 831.  
 Wise, F. B., 425, 559.  
 Wisker, A. L., 739.  
 Wisselingsh, C. van, 627, 825.  
 Withers, W. A., 381.  
 Withycombe, J., 373.  
 Withycombe, R., 208, 228,  
 231, 263.  
 Wodsedalek, J. E., 568.  
 Wohback, F., 508.  
 Wohltmann, F., 195, 394.  
 Woker, G., 312.  
 Wolbach, S. B., 880.  
 Wolcott, G. N., 552, 752.  
 Wold, I. K., 873.  
 Wolda, G., 650.  
 Wolf, F. A., 198, 845.  
 Wolfe, T. K., 529.  
 Wolfer, A., 117.  
 Wolff, A., 687.  
 Wolff, J., 32.  
 Wolf, F. W., 76, 192.  
 Wollák, K., 82.  
 Wolzogen Kühr, C. A. H.  
 von, jr., 217.  
 Wood, E. W., 498.  
 Wood, L. S., 743.  
 Wood, P. O., 322, 617, 809.  
 Wood, R. C., 95.  
 Wood, T. B., 199, 298.  
 Woodward, C. S., 97, 396.  
 Woodhouse, E. J., 250.  
 Woodman, A. G., 610, 808.  
 Woods, C. D., 699.  
 Woods, W. C., 456, 851.  
 Woodyard, C. R., 499.  
 Woodward, R. S., 706.  
 Woodward, S. M., 283.  
 Woodward, T. B., 671.  
 Woodworth, C. W., 652, 751.  
 Woodridge, G. H., 576.  
 Woolley, P. G., 580.  
 Woolley, V. J., 257.  
 Woolman, H. M., 644.  
 Working, D. W., 494.  
 Works, G. A., 395, 698.  
 Wormald, H., 49, 53, 55,  
 244.  
 Worst, J. H., 496.  
 Wright, A. M., 256, 506.  
 Wright, B. R., 661.  
 Wright, H. J., 238.  
 Wright, H. K., 680.  
 Wright, R. P., 670.  
 Wright, W. J., 150.  
 Wrightson, W. D., 353.  
 Wurth, T., 344.  
 Wussow, A. F. D., 315.  
 Wyatt, W. W., 118.  
 Wyssmann, E., 681.  
 Yakimoff, L., 187.  
 Yarnell, D. L., 189, 583.  
 Yeaw, F. L., 39, 340.  
 Yorke, W., 187.  
 Yoschida, S., 568.  
 Yothers, W. W., 60, 250,  
 255, 535.  
 Young, A. A., 615.  
 Young, C. O., 410.  
 Young, F. D., 414.  
 Young, H. D., 191, 365, 502.  
 Young, H. G., 322.  
 Young, H. J., 298.  
 Young, W. J., 777.  
 Young, W. S., 669.  
 Youngblood, B., 454, 467,  
 687.  
 Ynasa, H., 66, 263.  
 Zacher, F., 658.  
 Zaller, V., 624.  
 Zalcenski, R. G., 207, 715.  
 Zapparoli, T. V., 37, 38.  
 Zeldel, A. V., 355.  
 Zeller, H., 168.  
 Zenneck, L., 879.  
 Zharovonkova, I., 844.  
 Ziegler, E. A., 642.  
 Zietzschmann, O., 876.  
 Zimmermann, E., 811.  
 Zingie, M., 83.  
 Zinnsmeister, C. L., 245.  
 Zolla, D., 326, 331.  
 Zollinger, E. H., 709.  
 Zon, R., 306.  
 Zook, L. L., 433.  
 Zubkovsky, E. V. Z., 361,  
 454.  
 Zuckerkindl, H. N., 333.  
 Zuntz, N., 376.  
 Zur Horst, A., 869.  
 Zvierzomb-Zubkovsky, E.  
 V., 361, 454.  
 Zwick, 576.

# INDEX OF SUBJECTS.

NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective state experiment stations; "Alaska," "Guam," "Hawaii," and "P. R." to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

	Page.		Page.
Abattoirs. (See Slaughterhouses.)		<i>Acrocystis batatas</i> , studies, Del.....	156
<i>Abella</i> —		<i>Actinomyces</i> —	
<i>auriscutellum</i> n.sp., description.....	558	<i>chromogenus</i> as affected by cold,	
<i>subflava</i> , notes.....	66	U.S.D.A.....	538
Aberlaiden reaction, studies.....	577, 674	sp. in Norway.....	226
Abortin, therapeutic value.....	82	Actinomycosis, bovine, notes.....	782
Abortion—		<i>Adia genitalis</i> , notes.....	449
contagious, in cattle.....	581	<i>Adoretus tenuimaculatus</i> in Hawaii.....	59
contagious, in cattle, Wash.....	782	Adults and infants, digestion in.....	167
contagious, in cattle, diagnosis.....	880	<i>Æcidium callistephi</i> n.sp., descrip-	
contagious, papers on.....	184, 575	tion.....	242
contagious, review of investi-		<i>Acetoplus bruneri</i> , remedies, U.S.D.A.....	159
gations.....	386	Aero-electric plant, construction.....	191
contagious, vaccine for.....	184	<i>Æschynomene americana</i> , culture,	
in Great Britain.....	382	P.R.....	736
infectious, in mares and jennets	185	Afforestation. (See Forestation.)	
<i>Acacia pycnantha</i> seeds, nitrogen in.....	729	African coast fever, notes.....	879
<i>Acanthomyops interfectus</i> , remedies.....	62	Agar-agar, use in food products.....	167
Aearna, monograph, U.S.D.A.....	458	<i>Agave rigida sisilana</i> , culture in	
Acetic acid, effect on milk fat.....	507	Sigily.....	227
Acetone, detection.....	714	<i>Aggregata cberthi</i> , chromosome cycle.....	458
Acid—		Agrarian problem in Mexico.....	489
accumulation and destruction in		Agricultural—	
large succulents.....	730	associations in Bavaria.....	391, 392
cretion as affected by water		associations in United States.....	290
drinking.....	763	chemistry. (See Chemistry.)	
phosphate. (See Superphos-		clubs in Massachusetts.....	394
phate.)		colleges at Uckfield, England,	
Acidity, determination in potatoes.....	807	closing.....	498
Adoles—		colleges, organization lists,	
in omnivora and herbivora,		U.S.D.A.....	94
Wis.....	201	colleges, short courses in.....	297
studies.....	462, 763	(See also Alabama, etc.)	
Acids—		commerce, text-book.....	595
alkaline reaction in soils.....	720	cooperation in Europe.....	91
amino. (See Amino acids.)		cooperation in India.....	894
and salts, antagonism between.....	429	cooperation in Saskatchewan.....	91
as affected by humus acid.....	324	cooperation, papers on.....	288, 391
effect on growth of rice.....	31	credit banks, papers on.....	391
effect on permeability.....	429	credit in Europe.....	91
fatty, of food, passage into		credit in North Carolina, N.C.....	792
milk.....	472	credit in Oregon.....	289
fatty, variations during inani-		credit in Portuguese colonies.....	391
tion and feeding experiments.....	258	credit in Saskatchewan.....	289
free fatty, effect on flesh and		credit in United States.....	90
fire points of animal fats and		credit in Washington.....	91
oils.....	312	credit in Western States.....	690
<i>Acorus calamus</i> , oils of.....	407	credit legislation in United	
Acridity in plants.....	731	States.....	489

Agricultural—Continued.	Page.	Agricultural—Continued.	Page.
credit societies in India.....	893	machinery, calculating interest on, U.S.D.A.....	194
credit, treatise.....	595, 894	machinery, paper on.....	296
credit unions in North Carolina.....	496	machinery, selection and care, Oreg.....	789
education, cultural value.....	897	machinery, service and cost, U.S.D.A.....	587
education in Canada.....	696	machinery, tests.....	588
education in Cuba.....	307	meteorology. (See Meteorology.)	
education in England and Wales.....	394	opportunities for educated women.....	402
education in New England.....	596	organization in Europe.....	91
education in Ontario.....	196	organization in Netherlands.....	897
education in United States and Canada, treatise.....	291	Organization Society, report.....	134
education, papers on.....	307	production in Denmark.....	481
(See also Agricultural instruction.)		production in United States.....	280
exhibits, preparation.....	433	products, demand for.....	592
experiment stations. (See Experiment stations.)		products, foreign trade in, U.S.D.A.....	194
extension work, basis for.....	104	products, freight rates on.....	302
extension work, functions of.....	699	products, imports into Germany.....	185
extension work in New Jersey, N.J.....	197	products, marketing.....	490, 792
extension work, suggestions for high schools, courses and equipment for.....	793	products, marketing, N.C.....	792
high schools in North Dakota.....	897	products, marketing, U.S.D.A.....	792
implement shed, construction, Tex.....	687	products, marketing by parcel post.....	792, 620
implements, tests.....	88	products, marketing in North Carolina.....	288
institute at Obersiebenbrunn.....	492	products, marketing, treatise.....	893
institute of Santiago.....	196	products, prices in England and Wales.....	491
institute of University of Halle.....	394	products, prices in India.....	195
instruction—		research in England and Wales.....	294
dangers to.....	806	research in Uruguay.....	298
for interned soldiers.....	498	schools, district, in Georgia.....	621
home projects in.....	93	schools in Belgian Congo.....	491
home projects in, U.S.D.A.....	899	schools, intermediate, in Austria.....	491
in Canada.....	98, 491, 691	schools, political economy in.....	895
in Ceylon.....	697	small holdings in Italy.....	291
in Chile.....	196, 491	social week in Chile.....	293
in Dutch East Indies.....	492	statistics, errors in, Ohio.....	896
in elementary schools.....	395, 597, 599, 794, 899	statistics in British Empire.....	296
in high schools.....	395, 692, 793, 897, 898	statistics in Canada.....	490
in Latin America.....	290	statistics in Denmark.....	792
in Maryland.....	793	statistics in England and Wales.....	491
in New Hampshire.....	793	statistics in France.....	291, 491
in New Mexico.....	793	statistics in Hungary.....	298
in Ontario.....	196, 597, 897	statistics in India.....	92, 191
in rural schools.....	92, 693	statistics in Italy.....	698
in secondary schools in Maine.....	693	statistics in Queensland.....	792
in Sweden.....	492, 597	statistics in United Kingdom.....	792
secondary, conference on.....	607, 799	statistics, international.....	91, 290, 490
investigations v. experience.....	101	tenancy in Iowa.....	193, 792
journals, new.....	499	tenancy in Southwestern States.....	96
labor in Southwestern States.....	90	tenancy in Texas.....	290, 491
labor in western India.....	690	tenancy in United States.....	490
laborers in Ireland.....	289, 895	tenants, housing conditions.....	498
lands, reorganization in Bavaria.....	594	wages in western India.....	690
varia.....	594	warehouses in Bavaria.....	690
legislation in Great Britain, treatise.....	289	Agriculture—	
legislation, international.....	91	at American Association for the Advancement of Science.....	298
libraries, cooperation among.....	494	at British Association for the Advancement of Science.....	298

Agriculture—Continued.		Page.	Albumin—	Page.
at Pan-American Scientific Congress.....	304		humification .....	516
colonial, in Italy.....	491		milk in infant feeding .....	258
Department of. (See United States Department of Agriculture.)			use in food products.....	167
elementary, course in..... 93, 94, 292, 395			Alcohol—	
elementary, text-book .....	196,		injurious effect on plant cells.....	333
493, 598, 599, 793			psychological effects .....	663
experience v. investigations in.....	101		Alcoholic fermentation, chemistry.....	711
graduate school.....	300, 639		Aldoses, determination.....	11
history of .....	689		<i>Alebra albostricella</i> , notes.....	752
in Chile.....	491		<i>Aleyrodes</i> —	
in Chosen, Korea.....	792		<i>citri</i> . (See White fly.)	
in Connecticut.....	289		spp., notes .....	60
in Germany.....	689		<i>vaporariorum</i> , (See White fly, greenhouse.)	
in India, handbook.....	95		Alfalfa—	
in Japan.....	92		analyses, N.H.....	169
in Netherlands.....	194		analyses, Wyo.....	467, 667
in North Carolina.....	288		as a cause of sterility in dairy cattle, Cal.....	269
in Norway.....	92		breeding experiments, Can.....	34
in Pacific Coast States.....	391		cost of production, N.J.....	137
in Scotland and Ireland as affected by European war.....	298		crown gall, notes.....	241
in Spain.....	689		culture.....	528
in Uganda.....	291		culture, Colo.....	650
in United States.....	791		culture, Del.....	138
in upper Wisconsin, Wis.....	431		culture, Ga.....	139
in Uruguay.....	92, 394		culture, N.Y.State.....	35
intensive, in tropical America.....	306		culture experiments, Can.....	34
laboratory manual.....	94		culture experiments, Miss.....	227
metereology in.....	606		culture experiments, U.S.D.A.....	228, 229
relation to climate, U.S.D.A.....	114		culture in rows, Wash.....	735
treatise.....	689		culture in Wisconsin, Wis.....	431
tropical, technical education in.....	491		culture under dry farming, Idaho.....	731
yearbook.....	494		culture under irrigation, Colo.....	528
<i>Agrius</i> —			effect on milk and butter.....	570
<i>hastulifer</i> , life history and control.....	361		feeding value, Tenn.....	867
<i>viridis fagi</i> in New Jersey.....	355		fertilizer experiments, Del.....	138
<i>Aspidimor agrestis</i> , feeding habits.....	458		green, fertilizing value, Cal.....	219
<i>Agriotes</i> ( <i>Elater</i> ) <i>segetis</i> , notes.....	757		growth as affected by alkali salts, U.S.D.A.....	125
Acronomy, text-book.....	598		hay, analyses.....	164
<i>Agrotis ypsilon</i> . (See Cutworm, black.)			hay, analyses, Wyo.....	469
Air—			hay, effect on milk flow, U.S.D.A.....	570
alveolar, sampling.....	369		hay, grades of.....	528
bacteria in.....	208		hay v. green alfalfa for cows, N.J.....	180
currents, ascending, formula for adiabatic changes in.....	207		inoculation.....	528
measurement of humidity.....	416		irrigation, Cal.....	282
methods of bacterial analysis, N.Y.State.....	183		irrigation experiments, N.Mex.....	785
pressure over Europe.....	14		laccase, studies.....	225
rate of flow in soils, Mich.....	216		looper in Montana.....	255
temperature, relation to soil temperature.....	15		meal, analyses..... 72, 371, 566, 767	
upper, study by means of telescopes, U.S.D.A.....	614		meal, analyses, Ind.....	263
(See also Atmosphere.)			meal, analyses, Kans.....	169
Alama College—			meal, analyses, Mass.....	467
cotes.....	198, 495		meal, analyses, N.H.....	169
Station, notes.....	198, 495		meal, analyses, N.J.....	685
Station, report.....	693		meal, analyses, Tex.....	467
			meal, analyses, Vt.....	371
			meal, analyses, Wyo.....	469
			meal, fertilizing value, N.J.....	129
			moisture content and shrinkage, U.S.D.A.....	828

Alfalfa—Continued.	Page.	American—Continued.	Page.
pasture for pigs, N.J.	173	Society of Agricultural Engi-	
pasturing in Arizona, U.S.D.A.	169	neers	498
root-stock development, Wash.	735	Society of Animal Production	400, 579
seed, germination tests, Pa.	143	<i>Amerisbia prionozystis</i> n.sp., descrip-	
seed oil, chemistry of.	710	tion	456
seed production in relation to		<i>Amelastegia glabrata</i> , notes.	557
moisture, Iowa.	824	Amino acids—	
seedling experiments, U.S.D.A.	229	as affected by bromin.	805
stem rot, studies, Ky.	541	determination in feeding stuffs.	412
tea, analyses, Wyo.	469	determination in soils.	811
transpiration in.	522	determination in soils, Iowa.	811
varieties, Cal.	227	determination in urine.	505
varieties, Wyo.	630	in soils.	515
Algae, marine, distribution.	32	in wool.	262
Alimentary intoxications, notes.	575	Amins from organ extracts and body	
Alizarin oil, insecticidal value.	359	fluids	771, 775
Alkali—		Ammonia—	
determination in soils.	609	adsorption by soils	719
effect on concrete drain tile.	87	as a by-product of sugar in-	
effect on growth of rice.	31	dusdry	318
effect on permeability.	429	as a fumigant for mill insects,	
salts, effect on germination and		Mich.	259
growth of crops, U.S.D.A.	125	determination.	111, 502
soils or lands. (See Soils, al-		determination in soils.	514
kali.)		determination in urine.	508
Alkaline-earth metals, separation.	409	excretion as affected by water	
Alkaloids, detection in water.	410	drinking	767
Allantoin, use against beri-beri.	367	fixation by cell albumin.	30
Alligator pears. (See Avocados.)		oxidation in plants.	627
<i>Allobrocon (Diachasma) pilosipes</i>		Ammoniacal salts, adding to diet.	782
n.g. and n.sp., notes.	455	Ammonification in soils—	
Allyl alcohol, insecticidal and lar-		studies, Pa.	127
vicidal value.	359	studies, U.S.D.A.	619
Almond hulls as a feeding stuff, Cal.	262	Ammonium—	
Alnarp Agricultural and Dairy In-		carbonate, effect on germination	
stitute.	692	and growth of crops, U.S.D.A.	125
Aloin, insecticidal value.	359	chlorid, effect on ferric and alu-	
Alternaria—		minium hydroxids during heat-	
<i>panax</i> on ginseng, U.S.D.A.	245	tion	207
<i>solanii</i> as affected by cold, U.S.		hydroxid, use in extraction of	
D.A.	538	rosin	412
<i>Aithya rosea</i> , coloring matter of.	710	nitrate, fertilizing value.	514
Aithaen, studies.	710	nitrate, fertilizing value, N.J.	180
Alum, effect on action of chlorin.	885	salt, peculiar plant physiological	
Alumina, determination in mineral		action of.	729
phosphates.	112	sulphate, application.	24
Aluminium—		sulphate, effect on composition	
alloys for canteens and cooking		of meadow hay.	629
utensils.	257	sulphate, fertilizing value.	24,
effect on permeability.	34	25, 518, 529, 622, 629	
salts, effect on plants.	525	sulphate, fertilizing value, Cal.	219
Alunite as a source of potash.	328, 821	sulphate, fertilizing value, N.J.	129
Alveolar air, sampling.	369	sulphate, fertilizing value, Pa.	128, 133
Amaranthus, transpiration in.	622	sulphate for arid soils.	621
<i>Amarantus retrofractus</i> , analyses, N.		sulphate, history and manufac-	
Dak.	39	ture.	425
<i>Amblyomma variegatum</i> , notes.	851	sulphate, injurious to plants.	135
<i>Ambrosia trifida</i> , analyses, N.Dak.	39	sulphate, long-continued use,	
American—		Mass.	625
Association of Agricultural Col-		sulphate, long-continued use, Pa.	135
lege Editors.	796	sulphate, nitrification, Pa.	257
Farm Management Association.	792	sulphate, production from peat.	625
Milking Shorthorn Breeders' As-		sulphate, production from saw-	
sociation.	269	age.	449
		Amphimixis in <i>Spirogyra inflata</i> .	379

# INDEX OF SUBJECTS.

927

	Page.		Page.
<b>Amylase—</b>		<b>Animals—Continued.</b>	
activity, determination in pres-		of South India, treatise.....	549
ence of alkaloids.....	713	organisms in digestive tract of..	564
of potatoes, pathological alter-		pure-bred, registration in Brazil..	372
ations in.....	423	small, respiratory chamber for..	370
<b>Amylopsin, notes.....</b>	237	tuberculous, inspection.....	575
<b>Anagrella curvica n.g. and n.sp.,</b>		velocity of transmission of ex-	
description.....	857	citation in.....	29
<b>Anaphylatoxin, nature.....</b>	674	wild, diseases of.....	576
<b>Anaphylaxis—</b>		(See also Live stock, Cattle,	
chronic, kidney lesions in.....	873	Sheep, etc.)	
studies.....	773	<b>Aniseed oil, insecticidal and lar-</b>	
<b>Anaplasma marginale, culture in</b>		vicinal value.....	359
vitro.....	576	<b>Anomala acana, notes.....</b>	454
<b>Anastrepha—</b>		<b>Anopheles punctipennis—</b>	
serpentina, notes.....	856	breeding.....	358
zygicola n.sp., description.....	554	transmission of malaria by.....	358
<b>Anax junius, food habits.....</b>	549	<b>Anthocyan pigments—</b>	
<b>Apium, pernicious, in horses. 274, 280,</b>	681	investigations.....	223
<b>Anemometer, Robinson, U.S.D.A. ....</b>	118	review of literature.....	335
<b>Anesthetics in veterinary surgery.....</b>	576	<b>Anthocyanin, electric charge of.....</b>	525
<b>Angora goats. (See Goats, Angora.)</b>		<b>Anthocyanins, preparation.....</b>	710
<b>Animal—</b>		<b>Anthocyanins—</b>	
breeding, anatomy and physiol-		isolation.....	710
ogy in.....	195	studies.....	709
breeding, bibliography.....	370	<b>Anthrenus—</b>	
breeding, effect of popular sire in		grandis. (See Cotton-boll	
chemistry, progress in.....	311	weevil.)	
disease investigations of Rocke-		pomorum in Russia.....	857
feller Institute.....	498	quadrigibbus. (See Apple cur-	
diseases, control in United States		cullo.)	
diseases, diagnosis.....	81	signatus. (See Strawberry wee-	
diseases in Austria.....	674	vil.)	
diseases in British Guiana.....	777	<b>Anthrax—</b>	
diseases in Burma.....	275	bacillus, capsule formation.....	877
diseases in California.....	275	bacillus, staining.....	781
diseases in Egypt.....	275	diagnosis.....	81, 676, 781
diseases in Great Britain.....	382	immunization.....	185, 879
diseases in Maine.....	777	immunization, U.S.D.A.....	579
diseases in United Provinces.....	777	in Great Britain.....	382
diseases, spread through gar-		notes.....	575, 879
bage.....	274	<b>Anthrax fulvohirta, notes.....</b>	556
diseases, transmission by dogs..	280	<b>Antibodies, fate in precipitin reac-</b>	
diseases, treatise.....	383	tion.....	877
(See also specific diseases.)		<b>Anticarsia gemmatilis, studies.....</b>	358
fats. (See Fat.)		<b>Antigens—</b>	
husbandry instruction in high		and antibodies, coexistence in	
schools.....	195	the body.....	779
products, exports, U.S.D.A.....	194	detection and concentration.....	579
products in United States.....	393	excretion.....	579
<b>Animals—</b>		<b>Antiketogenesis, theory of.....</b>	462
domestic, sea-transport regula-		<b>Antimony, detection in water.....</b>	410
tions.....	575	<b>Antioxidase of tomato plants.....</b>	33
domestic, variability in.....	370	<b>Antiseptics, bactericidal properties..</b>	675
exercise with for rural schools,		<b>Ants—</b>	
U.S.D.A.....	292	Argentine, notes, N.J.....	158
feeding under germ-free condi-		destruction by dynamite, Pa....	125
tions.....	564	in Haiti.....	556
fur bearing, laws relating to,		in Hawaii.....	59
U.S.D.A.....	751	pavement, as a cold-frame and	
growth of.....	305	greenhouse pest, Va.Truck....	657
importation into Brazil.....	372	white. (See Termites.)	
injuries in Colorado.....	651	yellow field, notes.....	752
injuries to sugar beets.....	350	<b>Apanteles—</b>	
meat-producing, lymphatic		militaris, biology, U.S.D.A.....	455
glands.....	876	n.sp., descriptions.....	456

	Page.	Apple—Continued.	Page.
Apechoneura, studies.....	758	leaf spot or black canker, notes.....	54
Aphelenchus—		maggot attacking blueberries.....	82
armerodis, notes.....	841	Me.....	822
ritsemabosi, notes.....	249	mildew, treatment.....	352
Aphididae infesting sagebrush in		pomace, fertilizing value, Cal.....	219
Oregon.....	357	red bug, false, notes, N.J.....	158
Aphids—		red bug, lined, notes.....	152
control by lady beetles, Va.....		red bugs, oviposition.....	255
Truck.....	555	red bugs, studies, N.Y.Cornell.....	751
of Oregon.....	356	root rot, notes.....	49
relation to fire blight.....	452	rust, studies, Pa.....	154, 157
Aphis—		rust, studies, Va.....	51
brassicæ. (See Cabbage aphid.)		rust, studies, Wis.....	411
gossypii. (See Cotton aphid.)		scab, notes.....	818
pomi-mali. (See Apple aphid.)		scab, treatment.....	842
pseudobrassicæ, studies, Tex.....	452	scab, treatment, Idaho.....	747
rumicis (papaveris), remedies.....	755	seeds, analyses, U.S.D.A.....	20
Aphis, woolly—		stems, variations in, N.J.....	141
as a pear pest.....	357	sucker, studies.....	40
identity, U.S.D.A.....	854	tree tent caterpillar, notes, N.J.....	15
investigations.....	62	trees, wood decay in, Cal.....	59
mouth parts and suction mechanism in, U.S.D.A.....	653	Apples—	
of elm and Juneberry, Me.....	161	breeding experiments.....	49
Aphthous fever. (See Foot-and-mouth disease.)		breeding experiments, Idaho.....	738
Apiary inspection in Colorado.....	651	breeding experiments, S.C.....	64
Apiculture. (See Beekeeping.)		breeding in Idaho.....	42
Apis mellifera. (See Bees.)		calyx cup of, studies.....	84
Aplanobacter rathayi, notes.....	349	cider, analyses and classification.....	223
Apoplexy, parturient. (See Milk fever.)		cost of production.....	232, 48
Apple—		cost of production, Oreg.....	65
anthracnose, notes.....	542	culture.....	822
anthracnose or black spot, notes, Wash.....	95	culture experiments, Pa.....	14
aphids and red bugs, notes, Pa.....	160	culture experiments, U.S.D.A.....	217
aphis, remedies, N.J.....	147	culture in Northwest, Oreg.....	68
aphis, studies, U.S.D.A.....	734	dried, microbiology.....	49
aphis, woolly, and elm cluster louse, identity.....	357	dusting and spraying experiments, N.Y.Cornell.....	75
bark, healthy and diseased, oxidation in.....	136	dwarf v. standard, N.Y.State.....	24
bitter-rot fungus, utilization of pentoses by.....	351	fertilizer experiments.....	82
blight, notes.....	648	fertilizer experiments, Pa.....	118, 119
blister disease, notes.....	543	grading and handling, U.S.D.A.....	149
brown rot, notes.....	241	hardiness in relation to structure and composition, Iowa.....	242
bud disease, notes.....	49	harvesting.....	43
canker, studies, Mich.....	744	Jonathan spot rot of, N.J.....	157
canker, transmission by tree crickets.....	653	keeping qualities, S.C.....	63
collar blight, studies, Pa.....	247	marketing and distribution, U.S.D.A.....	18
collar rot, studies, Pa.....	154, 156	mulching experiments.....	8
curculio, remedies, N.J.....	147	parthenocarpy in.....	2
diseases in New South Wales.....	247	picking and handling.....	4
diseases in Pennsylvania.....	646	pollination.....	242, 24
diseases, treatment, N.Y.Cornell.....	747	propagation and shipping experiments.....	8
flea weevil, notes.....	254	protection against rabbits.....	2
fruit spot, notes.....	842, 846	pruning at planting.....	9
leaf dry spot, notes.....	842	ripening process, U.S.D.A.....	1
leaf-hopper, black, biology.....	451	spraying experiments, N.J.....	1
		summer pruning, Utah.....	1
		summer v. winter pruning, Idaho.....	1
		tillage v. sod mulch, Pa.....	1
		treatise.....	8
		varieties, N.Y.State.....	

	Page.		Page.
Apricot—		<i>Ascochyta</i> —	
Coryneum fruit spot, notes.....	352	<i>cardiaca</i> n.sp., description.....	843
gummosis and sour sap, notes.....	54	<i>olematidina</i> , studies, N.Y.State..	249
Monilia blight, studies.....	351	<i>colorata</i> as affected by cold, U.S.D.A.....	538
Apricots—		<i>Ascomycetes</i> sp. on betel vine.....	50
cost of precooling.....	637	Ash—	
dried, microbiology.....	460	characteristics and manage-	
pollination experiments.....	233	ment, U.S.D.A.....	846
Aqueous extracts, evaporation appa-		determination in plant sub-	
ratus.....	608	stances.....	202
Arabis disease, notes.....	750	Ashes—	
Arboriculture, bibliography.....	435	analyses.....	425
Archips—		as a source of potash.....	327, 425
<i>argyrospila</i> , pupal instar.....	357	as fertilizer, Ohio.....	494
<i>argyrospila</i> , remedies, N.Y.Corn-		(See also Wood ashes.)	
nell.....	755	Asparagus—	
<i>ceasariorana</i> , notes.....	752	fertilizer experiments, Mass.....	294
<i>Archias analis</i> , parasitic on army		fly, notes.....	851
worm.....	251	Aspartic acid, effect on action of alco-	
<i>Arctostaphylos columbiana</i> n.sp., de-		hol on plant cells.....	333
scription.....	338	<i>Aspergillus</i> spp. affecting coffee	
<i>Areca catechu</i> , culture in North Ka-		grains.....	545
nara.....	239	Asphalt, penetration tests, U.S.D.A..	685
Areca palm—		Asphaltum as a dressing for fruit	
collar rot, notes.....	50	tree wounds, Pa.....	154
koleroza disease, notes.....	55, 644	<i>Aspidiotus</i> —	
Arginine, determination in animal		<i>pernicius</i> , (See San José	
organism.....	804	scale.)	
<i>Argyresthia</i> —		<i>tsugæ</i> in New Jersey.....	355
<i>alternatella</i> , notes.....	450	Association—	
<i>elmorilla</i> , notes.....	553	of American Agricultural Col-	
<i>illuminatella</i> , notes.....	855	leges and Experiment Sta-	
<i>Arion circumscriptus</i> , feeding habits..	458	tions.....	798
Arizona—		of Official Agricultural Chem-	
Station, notes.....	198, 396, 495	ists.....	501
University, notes.....	396, 495	of Official Seed Analysts.....	832
<i>Armilleria</i> —		of Southern Agricultural Work-	
<i>melica</i> , notes.....	644	ers.....	1
sp. on oaks, Cal.....	241	Aster black neck or wilt disease.....	649
Army—		<i>Astycus immunitis</i> , notes.....	652
biscuit, recipes.....	256	<i>Athysanus</i> n. sp., description.....	255
worm, biology, U.S.D.A.....	455	Atmometers, porous cup, construc-	
worm, fall, studies, Ala.College..	163	tion and use.....	84
worm, notes.....	453, 752	Atmosphere—	
worm, notes, N.J.....	158	circulation and temperature,	
worm, notes, Ohio.....	494	U.S.D.A.....	614
worm, parasites of.....	251	eddy motion in, U.S.D.A.....	117
Arsenic—		penetrating radiation in, U.S.	
cumulative action in dipping....	180	D.A.....	614
detection in water.....	410	Atmospheric—	
fixation in surface soils, U.S.		circulation and radiation, treat-	
D.A.....	421	ise.....	414
sulphid, larvicidal value.....	359	noises, U.S.D.A.....	117
Arsenical spray injury, prevention,		pollution, investigations.....	718
Pa.....	164	pressure. (See Barometric pres-	
Arsenicals—		sure.)	
insecticidal value, U.S.D.A.....	60	temperature. (See Tempera-	
toxicity and use.....	851	ture.)	
Arsenious oxid as an alkalimetric		Atropia, detection in water.....	410
standard.....	312	Aujeszky's disease in mules in Flor-	
Artesian wells, decrease of flow.....	483	ida.....	275
Arthritis, pyemic, in foals.....	83	<i>Aulacaspis pentagona</i> , parasites of..	456
<i>Aseris euis</i> , description.....	280	Auroras, notes, U.S.D.A.....	413, 614
		<i>Autographa gamma californica</i> in	
		Montana.....	255

	Page.	Bacteria—Continued.	Page.
Autoparasitism in <i>Cassatha melan-</i>		in milk, soils, water, etc. (See	
<i>tha</i> .....	620	Milk, Soils, Water, etc.)	
Aurimones, bacterial test for.....	325	nodule, as affected by manganese..	31
Avocado bark beetle in Hawaii.....	59	paratyphosus-enteritidis, as a	
Avocados—		cause of fish poisoning.....	476
culture in Philippines.....	635	pathogenic, in candy.....	365
varieties.....	835	relation to beet blight.....	350
Azotobacter—		Bacteriology—	
activity in relation to soil con-		of cream ripening.....	672
dition.....	813	of ice cream, U.S.D.A.....	195
fixation of nitrogen by.....	422	treatise.....	876
in Danish forest soils.....	814	Bacterium—	
nitrogen release by.....	627	<i>beticolum</i> , inoculation experi-	
<i>Bacillus</i> —		ments with.....	845
<i>abortus</i> , detection in milk, U.S.		<i>lachrymans</i> n.sp., description,	
D.A.....	670	U.S.D.A.....	443
<i>amylolentus</i> , leaf invasions by,		<i>matricarum</i> , notes, S.C.....	642
Wash.....	647	<i>mori</i> , notes.....	619
<i>amylolentus</i> , notes.....	247, 648, 747	<i>pruni</i> , investigations, N.Y. Cor-	
<i>amylolentus</i> , relation to aphids..	452	nell.....	248
<i>amylolentus</i> , relation to apple		<i>pullorum</i> , detection in fowls	
collar rot, Pa.....	157	Mass.....	180, 275
<i>amylolentus</i> , studies, Pa.....	247	<i>pullorum</i> infection in chicks,	
<i>apioeris</i> n.sp., notes.....	244	Mass.....	387
<i>aurantius</i> n.sp., description,		<i>pullorum</i> infection in chicks,	
Iowa.....	78	treatment, N.C.....	881
<i>branchisepicus</i> , lesions produced		<i>pullorum</i> infection in fowls, ag-	
by.....	480	glutination test for.....	784
<i>bulgaricus</i> , tests of strains.....	574	<i>solanacearum</i> on peanuts, N.C..	52
<i>charruui</i> affecting hogs.....	470	<i>tularense</i> , lesions produced by..	550
<i>coagulans</i> n.sp., description,		<i>tumefaciens</i> , notes.....	247, 249, 844
Iowa.....	78	Bagasse as a fuel for sugar refineries.	487
<i>coli</i> , determination in ice cream,		Bagworm, notes, U.S.D.A.....	756
U.S.D.A.....	165	Bake ovens, electric, notes.....	460
<i>coli</i> , Endo medium as a test for,		Bakeries, inspection in Indiana....	801
Ky.....	167	Bakery products, fermentation losses.	690
<i>coli</i> , hydrogen ion concentration..	524	Bakhar, analyses and preparation..	711
<i>coli</i> , importance in judgment of		Baking, temperatures reached in....	69
water.....	389	Bamboo—	
<i>coli</i> on coconut palm.....	241	borer, notes.....	754
<i>coli</i> , relation to coconut palm		culture experiments, U.S.D.A....	272
bud rot.....	412	Bamboos of Andes region of South	
<i>lymphophilus</i> , notes.....	478	America.....	741
<i>mangifera</i> n.sp., description.....	447	Banana—	
<i>melonis</i> as affected by cold, U.S.		disease in Barbados.....	841
D.A.....	538	disease in Cuba.....	847
<i>paratyphosus</i> B, food poisoning		diseases in Jamaica.....	548
by.....	583	meal, analyses.....	256
<i>paratyphosus</i> B in pigeons.....	83	root disease, studies, U.S.D.A....	50
<i>pertussis</i> , lesions produced by..	480	Bananas—	
<i>sporogaea</i> as an indicator of		and banana flour, composition..	468
manurial pollution in milk....	272	as a host of Mediterranean fruit	
<i>synanthus</i> in milk, Iowa.....	78	fly, U.S.D.A.....	655
<i>typhosus</i> , viability in ice cream..	256	dried, studies.....	256
Bacteria—		Banteng and zebu, zoological rela-	
as affected by cold, U.S.D.A.....	538	tionship.....	466
changes in the animal body.....	877	Barium—	
colon-aerogenes, differentiation..	136	detection in water.....	410
detection in water.....	284, 285, 286	sulphur, insecticidal value.....	41
determination in cream.....	612	Bark—	
determination in ice cream,		beetle, notes.....	857
U.S.D.A.....	165	louse, oyster-shell. (See Oys-	
determination in milk.....	271, 612	ter-shell scale.)	
effect on sewage.....	591	louse, scurfy. (See Scurfy	
gas-producing, detection, Mich..	732	scale.)	

# INDEX OF SUBJECTS.

931

	Page.		Page.
Barley—		Beech fog and fructo-cumulus,	
analyses, Wyo.....	087	U.S.D.A.....	118
and wheat, hybrid between.....	339	Bean—	
chop, analyses, Kans.....	169	anthracnose, relation to tem-	
composition as affected by fer-		perature.....	541
tilization and soil prepara-		anthracnose, treatment, Mich.....	746
tion.....	230	aphis, control by lady beetles,	
culture, Ga.....	138	Va.Truck.....	555
culture, S.C.....	694	bacteriosis, studies, Mich.....	746
culture experiments, Oreg.....	228	blight, treatment, Mich.....	746
culture experiments, U.S.D.A.....	137, 228	leaf beetle on cowpeas.....	254
culture under irrigation, Colo.....	528	meal, effect on milk and butter.....	570
effect on milk and butter.....	570	straw, composition and digesti-	
effect on milk secretion, Cal.....	209	bility.....	565
feeding value, Tenn.....	867	weevil, Mexican, notes.....	857
fertilizer experiments.....	517,	weevil, notes.....	754
518, 622, 724, 820		Beans—	
fertilizer experiments, Mass.....	622	as affected by pod position, N.J.....	134
fertilizer experiments, N.J.....	132	as food.....	164
fertilizer experiments, Wyo.....	630	Bengal or Mauritius, as a cover	
floor, analyses.....	164	crop, P.R.....	736
germination as affected by sil-		bonavist, lablab, or hyacinth,	
ver nitrate.....	31	U.S.D.A.....	436
growth as affected by alkali		fertilizer experiments.....	27
salts, U.S.D.A.....	125	fertilizer experiments, Mich.....	729
meal, analyses, Wyo.....	469	inheritance in, N.J.....	146
prices and shrinkage, Ill.....	337	inheritance of habit in.....	41
rusts in Canada.....	51	jack, as a cover crop, P.R.....	736
seed coats, permeability.....	626	limitation studies, N.J.....	146
seed, migration of reserve ma-		Lyon, as a cover crop, P.R.....	736
terial to.....	35, 729	Lyon, hybridization experi-	
straw, composition and digesti-		ments, U.S.D.A.....	431
bility.....	565	seed, treatment with iron sul-	
varieties, Cal.....	227	phate.....	528
varieties, Ga.....	138	sword, as a cover crop, P.R.....	736
varieties, Idaho.....	734, 735	translocation of mineral con-	
varieties, U.S.D.A.....	229, 733	stituents, U.S.D.A.....	427
varieties, Wyo.....	629	variety resistant to anthracnose	
water requirements, Wash.....	720	velvet. (See Velvet beans.)	
yields in relation to rainfall.....	319	water requirements, Wash.....	720
Baryard grass, analyses, N.Dak.....	39	yield as affected by sulphur.....	726
Baryard manure—		Beech bark caterpillar, notes.....	63
analyses.....	517	Beef—	
application.....	517	adulteration with horse meat.....	113
as a nutrient for soil bacteria.....	327	fat, digestibility, U.S.D.A.....	364
effect on composition of cereals		scrap, analyses.....	263, 566
fertilizing value.....	621	scrap, analyses, N.H.....	169
fertilizing value, Cal.....	219	scrap, analyses, N.J.....	665
fertilizing value, Mich.....	723	Beekkeeping—	
fertilizing value, N.Mex.....	735	handbook.....	362, 556, 657
fertilizing value, Pa.....	128	in Philippines.....	635
fertilizing value, Wyo.....	630	notes, Mo.....	758
for arid soils.....	621	notes, Wash.....	95
storage experiments.....	517	Bees—	
Barometric pressure—		and their diseases, notes.....	656
at Washington, D.C., U.S.D.A.....	117	collection of pollen by.....	556
of western and equatorial		embryology, treatise.....	362
Africa.....	209	notes, Wash.....	796
relation to temperature, hu-		olfactory sense.....	758
midity, and latitude, U.S.D.A.....	413	queen, rearing and shipping.....	556
Bartonella bacilliformis, asexual		treatise.....	362
cycle.....	858	wintering, U.S.D.A.....	158, 454
Basic slag. (See Phosphatic slag.)		Beet—	
Bees—		blight, studies.....	349
colophoreæ u.sp., description.....	456	leaf-hopper, relation to sugar	
carinoides, parasite on bud		beet curly top.....	646
moth.....	250		

Beet—Continued.	Page.	Bibliography of—Continued.	Page.
pulp, dried, analyses.....	72,	alkali salts, effect on crops,	
263, 371, 566, 767		U.S.D.A.....	126
pulp dried, analyses, Ind.....	263	animal breeding.....	370
pulp, dried, analyses, Mass.....	487	animals, feeding under germ-free	
pulp, dried, analyses, N.H.....	189	conditions.....	564
pulp, dried, analyses, N.J.....	665	anthrax.....	78
pulp, dried, analyses, Tex.....	467	antibodies, fate in precipitin re-	
pulp, dried, analyses, Vt.....	371	action.....	87
pulp, moistened, for cows,		aphis, woolly.....	65
Wash.....	773	apple rust, Va.....	5
seeds, growing in Canada.....	635	arboriculture.....	42
tops, analyses and feeding		army worm, U.S.D.A.....	452
value.....	664	bacillus of Preisz-Nocard.....	18
Beetles—		<i>Bacterium pruni</i> , N.Y.Cornell.....	20
injurious in Porto Rico.....	753	bees.....	262
respiratory activity in sun-		beri-beri.....	46
light.....	30	buffalo goats, U.S.D.A.....	79
Beets—		cactus diseases.....	512
culture experiments, U.S.D.A.....	228	carotin-xanthophyll group in	
effect on milk.....	671	Chrysomelidae.....	80
effect on soil moisture.....	17	castration in rabbits.....	56
fertilizer experiments.....	431, 517, 622	celery heart rot.....	24
fertilizer experiments, Ill.....	532	cheese, soft, N.Y.Cornell.....	184
fertilizer experiments, Mich.....	723	chemistry.....	467
field or fodder. ( <i>See</i> Mangels.)		Chermes.....	523
for dairy cattle.....	873	cinchona mopo seed bed disease.....	749
invertase in.....	524	coccaceae.....	477
sugar. ( <i>See</i> Sugar beets.)		coconut pests.....	749
sulphur as a fertilizer for.....	331	corn culture, Vt.....	267
v. silage for milk production,		country life.....	65
Ohio.....	670	daffodils.....	74
yields in relation to rainfall.....	319	diet of Swiss workmen.....	64
Beggar-weed hay, ground, analyses.....	767	Diplodia.....	77
Begonia flowers, abnormal, studies.....	225	dipping.....	186
Belladonna—		diseases, insect-borne, in Pan	
as affected by composition of		America.....	74
soils.....	18	<i>Doitchoa lablab</i> , U.S.D.A.....	467
selection for alkaloid content,		duodenal regurgitation.....	80
U.S.D.A.....	237	dwarf plants.....	29
Beri-beri—		egg production in hens, U.S.D.A.....	49
and cotton-seed meal poisoning		ethylene, effect on plants.....	62
in pigs, U.S.D.A.....	474	exosmosis from plant roots.....	80
in Brazil.....	462	farming.....	65
infantile, treatment.....	662	fermentation, alcoholic.....	30
notes.....	662	fertilizers.....	48
review of investigations.....	462	flower color.....	32
treatment with constituents of		flower gardening.....	28
rice polishings.....	367	flowers, anomalous.....	80
Bermuda—		frost, U.S.D.A.....	43
grass, culture experiments,		fruit fly, Mediterranean.....	82
Miss.....	227	fungi.....	4
hay, grades of.....	528	ga'dening.....	6
Berries, cover crops for, Wash.....	294	gas, illuminating, effect on	
Beschläsenche. ( <i>See</i> Dourine.)		roots.....	2
Betel-nut palm, culture in North		gonadectomy in rats.....	20
Kanara.....	239	grape culture, Iowa.....	40
Beverages—		guinea pigs, genetic studies.....	46
analyses.....	762	heliotropism as affected by	
analyses, N.Dak.....	67	salts.....	50
nonalcoholic carbonated, exam-		heredity.....	10
ination, Ky.....	166	heredity in plants.....	10
Bibliography of—		heredity of doubleness in Mat-	
abortion, infectious, in cattle.....	880	tholia and Petunia.....	1
agricultural associations in		heredity of habits 'a beans.....	1
Posen and West Prussia.....	893	home furnishing and decoration	

# INDEX OF SUBJECTS.

933

Bibliography of—Continued.		Bibliography of—Continued.	
	Page.		Page.
honeybees, embryology.....	362	spermatozoa, duration after fe-	
humus formation.....	515	cundation.....	864
hydrotropism in roots.....	224	sporotrichosis.....	385
insects as carriers of chestnut		sterility in mules.....	569
blight.....	448	strawberry culture, N.Y.State..	42
frigation in California.....	682	sugar in plant tissues.....	729
land grants in United States..	594	sulphur compounds in plant nu-	
landscape gardening.....	439	trition, U.S.D.A.....	221
landscape gardening, Ill.....	536	teak, annual ring formation in..	839
leaf miners.....	553	<i>Trametes pini</i> .....	547
leaves, senile changes in, N.Y.		transpiration in plants.....	335
Cornell.....	222	trichiniasis.....	478
medicinal plants.....	236	tuberculosis, bovine.....	679
meteorology and seismology.		tuberculosis in chickens.....	880
U.S.D.A.....	117, 413, 614	variability and amphimixis.....	370
Microlepidoptera.....	855	water-culture experiments.....	826
milk bacteria.....	776	water requirements of plants..	522
milk, fermented, U.S.D.A.....	474	water supply in Italy.....	786
milk from different quarters		wilting in plants.....	825
of udder.....	270	wine making in France.....	690
milk, nutritive value.....	164	wood disinfection.....	781
mulberry blight.....	649	zoology, Canadian.....	651
mulberry scale and its natural		Bile, secretion.....	463
enemies.....	456	Biliary fever. (See <i>Pyroplasmosis</i> .)	
mutation in plants.....	629	Biochemistry, treatise.....	607
<i>Nematodirus filicollis</i> .....	168	Biographical sketch of—	
oak <i>Oidium</i> .....	650	Hilgard, E.W.....	301
<i>Onchocerciasis</i> in cattle.....	582	Scovell, M.A., Ky.....	694
<i>Opilina</i> .....	454	Biology, treatise.....	263
ornithology of Porto Rico, U.S.		<i>Biosteres</i> —	
D.A.....	850	<i>rhagoletis</i> n.sp., description..	456
<i>Paspalum</i> poisoning in cattle,		sp., parasitic on bud moth.....	250
Miss.....	676	Blotite potash, solubility.....	328
pea aphids, U.S.D.A.....	62	<i>Bipatium keucense</i> in Kentucky..	458
pea thrips.....	451	Bird houses and nesting boxes, con-	
pellagra.....	260	struction.....	650
permeability of plant tissue.....	732	Birds—	
phosphate deposits in Florida..	425	attracting.....	238, 650
physiology.....	658, 777	attracting, U.S.D.A.....	849
plant chlorosis, Conn.State.....	53	feeding habits.....	650
plant diseases, Ill.....	348	of lower Colorado Valley.....	547
plum brown rot, U.S.D.A.....	445	of Porto Rico, U.S.D.A.....	849
pollination in Composite.....	727	Biscuits, army, recipes.....	256
potato late blight, Wis.....	246	<i>Biston hirtarius</i> , studies.....	63
potato tuber rots, U.S.D.A.....	246	Bituminous road materials, methods	
prairie dogs, Nebr.....	58	of examination, U.S.D.A.....	318
puerperal diseases in cattle.....	386	Black tongue in dogs.....	275, 682
putrefaction of meat, etc.....	164	Blackberries—	
radishes.....	532	culture, N.Y.State.....	42
reproduction in relation to vege-		fertilizer experiments, Mass.....	294
tative vigor in plants.....	824	Blackberry anthracnose, treatment,	
Rhizoctonia.....	841	Wash.....	445
rotation of crops, Vt.....	337	Blackhead—	
<i>Sarcocystis tenella</i> .....	384	in turkeys.....	275
seeds, delayed germination in..	31	in turkeys, Ky.....	583
sexuality in Uredineae.....	526	Blackleaf 40, insecticidal value, N.J.	147
silos and silage.....	665	Blackleg—	
silver leaf disease.....	648	atypical, in United States.....	276
soil fungi of Norway.....	226	in hogs.....	479
soil protozoa, U.S.D.A.....	21	in hogs in Pennsylvania.....	276
soils and manures.....	717	Blackwood, Bombay, notes.....	240
soils of San Luis Province,		Blast furnace gas dust, composition.	623
Argentina.....	512	Bleaching powder—	
<i>Sorghum</i> loose kernel smut.....	444	disinfection of water by.....	885
		use against fly larva, N.J.....	160

	Page.	Books on—Continued.	Page.
<i>Blepharocorys equi</i> n.sp., notes.....	783	bacteriology.....	876
<i>Blepharoptera serrata</i> , hibernation.....	254	bees.....	362, 556, 627
Blight, insect carriers of.....	648	biochemistry.....	607
Bloat in cattle, treatment, Ky.....	581	biology and its makers.....	282
Blood—		Burbank, Luther.....	440
changes in due to method of		butterflies.....	552
slaughter.....	372	butterflies of Australia.....	457
dried. ( <i>See</i> Dried blood.)		carbon bisulphid as an insect-	
examination in glanders.....	81	cide.....	249
fat, studies.....	562, 563	castrations.....	44
feeding value.....	865	castration of animals.....	477
meal, analyses, Tex.....	467	catalysis.....	312
meal, fertilizing value.....	24	cattle.....	467
of slaughtered animals as hu-		cattle diseases.....	477, 478
man food.....	459	cereals.....	558
serum, action on cane sugar.....	675	chemical analysis.....	711
sugar as affected by diet.....	562	chemistry.....	407, 580
Blossoms, pollinated, protection.....	40	chemistry, colloid.....	861
Blowflies, remedies.....	359	chemistry, household.....	458
Blue grass—		chemistry, organic.....	801
palatability, Ohio.....	865	chemistry, physiological.....	503, 607
seed, harvesting and curing, Ky.....	830	chemistry, technical.....	801
seed, viability and germinabil-		cooking.....	595, 734
ity, Ky.....	630, 620	corn.....	526
Blueberries—		cotton statistics.....	555, 691
culture, U.S.D.A.....	534	country girls.....	290
insects affecting, Me.....	851	daffodils.....	741
Body surface, measurement in man.....	68	dairying.....	650
Boller laws in United States and		Diptera.....	654
Canada.....	588	diseases of wild animals.....	576
Boilers, steam, repairing.....	830	drug analysis.....	712
Boll weevil. ( <i>See</i> Cotton-boll weevil.)		engines, gas, gasoline, and oil.....	257
Bomb calorimeter, adiabatic device		entomology, medical and veteri-	
for, Pa.....	168	nary.....	820
Bombidae, notes.....	302	exercise in education and medi-	
Bone—		cine.....	261
cracked, analyses, Vt.....	371	farm and school problems for	
meal, analyses, Ind.....	263	high schools and normals.....	795
meal, analyses, Mass.....	467	farm crops, feeding of.....	326
meal, analyses, N.J.....	665	farming.....	635, 796
meal, analyses, Vt.....	371	feeds and feeding.....	261, 265
meal, steamed, fertilizing value		fermentation, alcoholic.....	218
Cal.....	519	fertilizers.....	58, 29
meal, steamed, fertilizing value,		flax culture in Argentina.....	494
Cal.....	210	flora of northwest coast of	
meal, steamed, for arid soils.....	621	United States.....	526
Bones, use as human food.....	650	floriculture.....	595, 626
Books on—		food analysis.....	506, 610, 718
agricultural commerce.....	595	forage crops.....	586
agricultural credit.....	595, 894	fruit culture.....	553
agricultural drawlag and de-		fur.....	570
sign.....	487, 598	gardening.....	59, 635, 836
agricultural education in United		gardening, ornamental.....	238, 243, 253
States and Canada.....	201	gardening, vegetable.....	340, 345, 823
agricultural politics in Great		gardens, mountain.....	367
Britain.....	280	genetics.....	367
agricultural products, market-		goats.....	270
ing.....	893	grape berry moths.....	553
agriculture.....	689	ground-levels in democracy.....	776
agriculture, elementary.....	93,	highway engineering.....	586
196, 395, 493, 598		home economics.....	293, 724
agriculture in India.....	95	home economics instruction in	
agronomy.....	598	France.....	890
apples.....	342	home grounds.....	28
atmospheric circulation and ra-		honeybee, embryology.....	262
diation.....	414		

Books on—Continued.	Page.	Books on—Continued.	Page.
horse diseases.....	477, 794	rubber and resin yielding plants.....	838
horses.....	268, 668, 794, 869	rural Denmark and its schools.....	196
house flies.....	855	rural education.....	292
household wastes, disposal.....	790	rural housing.....	895
housekeeping conditions among "Pennsylvania Germans".....	257	rural sociology.....	790
hygiene and sanitation, military.....	369	saxifrages or rockfolks.....	45
ice cream and ices.....	890	sewerage.....	886
Ichneumonidae of Great Britain.....	657	shrubs.....	345
immunology.....	275	skunk culture.....	269
infant feeding and metabolism.....	460	soil colloids.....	515
insects.....	651	soil physics.....	293
insects injurious to man in war.....	251	soils.....	321, 716, 793
insects of South India.....	549	spices.....	166
irrigation and settlement in America.....	482	spruce, growth and yield in high mountains.....	347
irrigation in United States.....	784	sugar manufacture.....	598
irrigation practice and engineer- ing.....	481, 482	sweet corn.....	41
land grants in United States.....	594	sweet peas.....	238
land registration, Torrens sys- tem.....	489	textile plants.....	829
land surveying.....	485	timber.....	537
landscape gardening.....	45, 439	tomatoes.....	737
live stock.....	565, 866	veterinary dissection.....	480
live stock diseases.....	278, 383	veterinary pathology.....	477
lymphatic glands in meat-pro- ducing animals.....	876	veterinary posology and thera- peutics.....	777
mammals of Great Britain.....	57	water examination.....	609
marketing.....	595, 893	water, irrigation.....	481, 482
meteorology.....	13	water purification plants.....	380
milk and its products.....	380, 611	water supply.....	83
milk, laboratory guide.....	571	weather.....	413
mosquitoes of North America.....	453	wheat.....	293
mushrooms.....	532, 761	wine making in France.....	690
mutation in plants.....	629	wounds and their treatment.....	876
nature study.....	599	yeast and alcoholic fermenta- tion.....	711
nutrition.....	658	<i>Bophilus annulatus.</i> (See Cattle ticks.)	
oil seeds and feeding cakes.....	565	Borax—	
oils, fats, and waxes.....	507	larvicidal value.....	359
orchids.....	741	use against fly larvae, N.J.....	160
organic compounds.....	312	Bordeaux mixture—	
peat and peat moors.....	618	analyses, Mich.....	436
peat litter.....	624	analyses, N.J.....	639
physiology.....	777	composition.....	540
plgs.....	268	copper content.....	748
plant diseases.....	49, 794	fungicidal value, N.J.....	147
plant growth and soil condi- tions.....	321	preparation and analyses.....	711
plant histology.....	727	preparation and use.....	643
plant nutrition.....	135, 326	Borers of Java.....	650
plants, alimentary and medic- inal.....	533	Boric acid, insecticidal value.....	359
plants, climbing.....	741	Boron—	
plants, house and window.....	238, 836	effect on plant growth.....	428
population, Malthusian theory.....	594	effect on plant growth, U.S.D.A.....	625
poultry.....	269, 377, 470	Botany—	
poultry diseases.....	280, 481, 881	and phytopathology, relation- ship.....	48
protein and humin substances.....	708	of southern Patagonia.....	206
public health legislation in United States.....	661	yearbook.....	494
pumps, centrifugal.....	482	Botryodiplodia, non validity of genus.....	242
rhubarb culture.....	232	Botryodiplodia—	
river regulation.....	885	sp. on oaks.....	448
roees.....	45	theobronæ, notes.....	849
		Botrytis cinerea. (See Grape gray rot.)	

	Page.		Page.
Bottle, collecting, description-----	751	Brine from fermentation of pickles, analyses, Mich-----	714
Bottling works, inspection in Indiana-----	861	British-----	
Bouillon cubes, analyses-----	761	Cotton Growing Association, work of-----	227
Box-leaf midge, notes-----	752	Meteorological Office, work of-----	319
Boxwood leaf miner in California-----	64	Bromates, determination-----	712
Boys-----		Brombenzene vapor, larvicidal value-----	359
club work in Massachusetts-----	394	Brome grass-----	
club work in Nevada-----	899	culture experiments, Wyo-----	630
clubs, organizing-----	793	palatability, Ohio-----	865
field-crop competitions-----	493	Bromin, effect on proteins and amino acids-----	893
<i>Brachyopa</i> n.sp., notes-----	554	Bromoacetylxylose, notes-----	498
"Bracken sickness" in cattle-----	383	Bromus fruit and leaves, anatomy of-----	35
Bran-----		Brooder stoves, tests, N.J.-----	178
analyses-----	371, 663	Broom corn-----	
analyses, N.H.-----	168	culture, Colo-----	650
as human food-----	490	culture experiments, U.S.D.A.-----	229
digestibility-----	760	Brown-tail moth, notes-----	250, 752
(See also Wheat, Rye, etc.)-----		<i>Bruchus</i> -----	
Braxy in lambs-----	383	<i>chinensis</i> . (See Cowpea weevil.)-----	
Bread-----		<i>limbatus</i> , notes-----	857
analyses-----	460	<i>obtectus</i> . (See Bean-weevil.)-----	
as affected by wrapping, Ky-----	761	<i>pisorum</i> . (See Pea-weevil.)-----	
changes in during baking and staling-----	859	<i>quadrinaculatus</i> , notes-----	754
composition and nutritive value-----	760	Bruchid, detection in water-----	419
containing sugar, spoiling-----	660	<i>Bryophyllum calycinum</i> , inhibition of regeneration or growth in-----	730
determination of flour content-----	113	Buckwheat-----	
digestibility as affected by phosphates-----	660	bran, analyses, Ind-----	203
food value of different types-----	459	effect on milk and butter-----	570
leavening agent from chick-pea-----	560	fertilizer experiments, N.J.-----	139
lessons in-----	693	middlings, analyses-----	72
meal, analyses, N.J.-----	605	middlings, analyses, Ind-----	263
poisonous, notes-----	660	middlings, analyses, N.J.-----	665
porous, from starch-----	460	offal, analyses, N.J.-----	666
staling of-----	858, 859	screenings, analyses and feeding value-----	663
use of sugar beets in-----	660	varieties, Wyo-----	610
war, digestibility-----	660	varieties, Wyo-----	758
Breakfast foods. (See Cereal foods.)-----		Buffalo gnats, studies, U.S.D.A.-----	
Breed, definition-----	466	Bulbar paralysis, infectious, in mules in Florida-----	255
Breeding-----		Bumblebees, collection of pollen by-----	534
experiments, recording types of mating in-----	72	<i>Bupalus piniarius</i> , life history-----	251
numerical results of diverse systems-----	764	Burbank, Luther, life and work of-----	449
(See also Animal breeding and Plant breeding.)-----		Burgundy mixture-----	
Brewers' grains, dried-----		as a substitute for Bordeaux mixture-----	815
analyses-----	72, 371, 566	copper content-----	718
analyses, Ind-----	263	preparation and use-----	615
analyses, Mass-----	467	Butter-----	
analyses, N.H.-----	169	adulteration, detection-----	13
analyses, N.J.-----	665	as affected by feeding stuffs-----	471, 570
analyses, Vt-----	371	bacteria in-----	672
Brewery-----		composition and characteristics-----	289
waste products, preservation-----	767	digestibility, U.S.D.A.-----	564
waste, utilization-----	262	fat. (See Fat and Milk fat.)-----	473
yeasts, composition and digestibility-----	185	fishy flavor in-----	778
Brick pavements, construction-----	589	flora as affected by salt, Mich-----	281
Bridges-----		making, investigations, Cal-----	171
steel and concrete highway, specifications-----	685	making on the farm, Wash-----	67
trail, construction, U.S.D.A.-----	191	making, overrun in-----	5
		making, studies, Pa-----	

	Page.		Page.
Butter—Continued.		<i>Calandra oryza.</i> (See Rice-weevil.)	
production as affected by æstrum, Ky.....	670	calcmeter, description, Ky.....	503
production, relation to escutcheon, Ky.....	670	Calcium—	
Swedish "Rune" brand.....	572	arsenate, insecticidal value.....	250
Butterflies—		arsenate, insecticidal value, U.S. D.A.....	60
manual.....	552	carbonate, determination in limestones, Ky.....	503
of Australia, monograph.....	453	carbonate, effect on development of <i>Digitalis purpurea</i> .....	135
Buttermilk—		carbonate, effect on protein content of soy bean, N.J.....	141
artificial, manufacture.....	474	carbonate, effect on soil phosphates, Tex.....	421
for chicks, N.C.....	881	carbonate, effect on strawberries, Pa.....	150
manufacture, Ind.....	775	chlorid, effect on germination and growth of crops, U.S.D.A.....	125
preparation and use, U.S.D.A.....	474	cyanamid as a retarder of denitrification.....	219
Buzzards, relation to hog cholera.....	275	cyanamid, fertilizing action in relation to soils.....	820
Cabbage—		cyanamid, fertilizing value..... 22, 24, 25, 431, 518, 622, 820	
analyses and feeding value.....	664	cyanamid, fertilizing value, Cal.....	219
aphis, control by lady beetles, Va.Truck.....	555	cyanamid, fertilizing value, N.J.....	130
aphis, endoparasites of, Wash.....	753	cyanamid, manufacture.....	622
aphis, notes, N.Y.State.....	62	cyanamid, storing.....	724
black rot, notes.....	644	determination.....	712
club root, notes.....	241, 842	determination in urine and feces.....	508
culture experiments, Pa.....	630	effect on concrete sand.....	787
fertilizer experiments, Ala.College.....	833	effect on lupines.....	724
legge.....	582	nitrate, fertilizing value..... 518, 622	
seed, growing in Canada.....	635	nitrate, fertilizing value, N.J.....	130
seed, raising and harvesting.....	232	phosphate, effect on composition of milk.....	270
stem rot, notes.....	241	salts as a factor in onset of labor.....	184
varieties, Ala.College.....	833	salts, effect on canned foods.....	87
varieties, Pa.....	146	sulphate. (See Grpsum.)	
yellows, control, Wis.....	542	Calf meals, preparation and analysis, Mass.....	667
Cashew—		California—	
budding and grafting experiments.....	740	Station, report.....	294
butter, digestion and absorption.....	257	University, notes.....	205, 600
diseases in Grenada.....	841	Callas, phylloidy of corolla in, N.J.....	143
diseases in Jamaica.....	349	<i>Callieratides rana</i> , notes.....	652
diseases in Uganda.....	540	<i>Calliphantes thurberia</i> n.sp., description.....	363
fertilizer experiments.....	344, 438	<i>Calliphora erythrocephala</i> , hibernation.....	254
green manure crops for.....	344	Calorimeter, bomb, adiabatic device for, Pa.....	108
industry in West Indies.....	438	Calves—	
insects affecting..... 349, 549, 652, 851		care and management, Ohio.....	471
leaf disease, notes.....	50	dairy, raising, Mass.....	667
moth parasites, rearing and liberating.....	855	feeding experiments.....	868
spraying experiments.....	50	feeding experiments, Cal.....	265
trees, grafted, yield data.....	438	feeding experiments, Ind.....	774
witches' broom, investigations.....	848	feeding experiments, Mass.....	867
<i>Carvela piceana</i> , notes.....	855	feeding experiments, N.J.....	180
Cassia—		feeding experiments, Wash.....	773
accumulation and destruction of acid in.....	730	food requirements, Ind.....	775
desiccation and starvation experiments.....	430	triplet, notes.....	767
destruction in Australia.....	530		
diseases in Queensland.....	543		
distribution.....	430		
glact, flowers of.....	430		
growth and colloid hydration.....	34		
insects affecting.....	549		
narcotic, studies.....	336		
<i>Cassia dubium</i> n.sp., description.....	539		
caffeine in Java tea.....	160		

	Page.		Page.
<i>Campanula medium</i> , <i>Sclerotinia</i> disease of.....	354	Carotin-xanthophyll group in Chrysomelidae.....	865
Campers, handbook for, U.S.D.A.....	46	Carotinoids—	
<i>Campoplex variabilis</i> n.sp., description.....	363	in insects.....	865
<i>Campsomeris dorsata</i> , notes.....	455	in plants.....	627
Canadian experimental farms, notes.....	498	<i>Carpocapsa pomonella</i> . (See Codling moth.)	
<i>Canavali obtusifolia</i> , culture, P.R.....	736	<i>Carpophilus (Scarabaeus) hemipterus</i> , notes.....	454
<i>Canavalia ensiformis</i> , fertilizing value.....	34	Carrot seeds, growing in Canada.....	655
Candy manufacture, sanitary aspects.....	365	Carrots—	
Cane—		culture experiments, Can.....	34
borers, notes, Mo.Fruit.....	361	effect on milk and butter.....	579
sugar as affected by blood serum.....	675	<i>Caryum petroselinum</i> as a host of root-worm.....	349
sugar in milk as affected by heat.....	164	Casein—	
sugar sirup, analyses.....	660	heated, nutritive value.....	269
sugar, synthesis.....	803	of goat's milk, composition, N.Y. State.....	706
Cane-strinfidae, new genus.....	66	spray, preparation and use.....	745
Canned foods, mineral content.....	67	Cassava—	
Canneries, inspection in Indiana.....	861	die-back, treatment.....	641
Canning—		diseases in Trinidad and Tobago.....	31
industry in New York.....	40	flour for dairy cattle.....	875
notes.....	714	insects affecting.....	754
Cantaloups. (See Muskmelons.)		leaf and stem disease, notes.....	545
Caoutchouc. (See Rubber.)		pulp, analyses.....	655
<i>Capnodium brasiliense</i> , treatment.....	540	spraying experiments.....	56
Carabaeos, origin and development.....	566	stem borer, notes.....	67
Carbohydrate—		<i>Cassia chamaecrista</i> , culture, P.R.....	759
indigestion, notes.....	563	Cassia oil, constituents of.....	595
transformations in sweet potatoes, U.S.D.A.....	522	<i>Cassytha mclanthal</i> , autoparasitism.....	626
Carbohydrates—		Castor bean poisoning, studies.....	495
as a substitute for fat for infants.....	462	Castration—	
effect on protein metabolism.....	762, 763	effect on internal secretion glands of rabbits.....	861
effect on secretion of urine in infants.....	763	of animals, treatise.....	477
of pine wood.....	608	Catalase, rôle in plant respiration, Md.....	523
relation to humus.....	515	Catalpa :phinx, notes, U.S.D.A.....	759
substitution by fat in protein-free diet.....	168	Catalysis, treatise.....	312
Car on—		Catarrh—	
bisulphid, insecticidal value.....	249, 851	infectious, in horses, treatment.....	881
bisulphid, insecticidal value, Mich.....	252	infectious intestinal, in cattle.....	575
black, effect on action of soil organic compounds, Tex.....	126	laryngo-tracheal, in horses.....	490
dioxid, determination.....	504, 610	<i>Catha edulis</i> , culture in Egypt.....	482
dioxid, determination in waters and effluents.....	410	Cattle—	
dioxid, formation from humus preparations.....	19	Africander, notes.....	767
dioxid, formation in presence of carbohydrates, N.J.....	127	blood, changes in due to method of slaughter.....	372
dioxid tension in alveolar air.....	369	breeding and management, treatise.....	467
tetrachlorid, insecticidal value, Mich.....	253	breeding, maintenance in winter, Pa.....	173
Carnation wilt, notes.....	242	Central-German red, notes.....	472
Carnations, treatise.....	44	dairy breeds, history and development.....	264
<i>Carnegeia gigantea</i> , accumulation and destruction of acid in.....	730	dairy, cost of raising, Ohio.....	476
		development of limbs.....	564
		digestion experiments with.....	572
		dipping, U.S.D.A.....	478
		diseases, nature and treatment, diseases, treatise.....	278, 477, 478

# INDEX OF SUBJECTS.

939

Cattle—Continued.		Page.	Cephalosporium—		Page.
fattening in relation to feed and environment.....	305		<i>leproyi</i> , association with green-house white fly.....	452	
feeding experiments.....	566		<i>sacchari</i> , notes.....	49	
feeding experiments, Ariz.....	170		<i>Cephalothecium roseum</i> as affected by cold, U.S.D.A.....	538	
feeding experiments, Pa.....	171		<i>Cephenomyia</i> —		
feeding experiments, Wyo.....	467		<i>abdominalis</i> n.sp., description..	64	
feeding in south Texas.....	265		<i>pratti</i> n.sp., description.....	554	
feeding, profits and losses in.....	867		<i>Cephus occidentalis</i> , studies.....	250	
fitting for the show ring.....	73		Cerambycid larvae, Henriksen's review.....	361	
gestation period, determination	565		<i>Ceratitis capitata</i> —		
growing, nutritive ratios for.....	372		control by poisoned bait.....	360	
industry in Bengal.....	767		control in Hawaii.....	758	
inspection for interstate shipment.....	185		notes.....	856	
milking Shorthorn, association in America.....	269		<i>Ceratoma trifurcata</i> . (See Bean leaf beetle.)		
non-tuberculous, advance registration for.....	184		<i>Ceratonia catalpa</i> . (See Catalpa sphinx.)		
poisoning by yellow jasmine, N.C.....	80		Ceratopogoninae, new, from Peru....	553	
pure bred, handling.....	185		<i>Cercospora</i> —		
raising in Italian Somaliland.....	227		<i>beticola</i> , studies, U.S.D.A.....	845	
rations for.....	72, 372		<i>personata</i> , studies, U.S.D.A.....	645	
Shorthorn, in Argentina.....	264		sp. on pistachio.....	843	
ticks, eradication.....	275, 679		spp. on pigeon peas.....	52	
ticks, notes.....	851		Cereal—		
ticks, remedies, U.S.D.A.....	479		diseases in Russia.....	842	
(See also Ticks.)			diseases, treatment.....	541	
tuberculi reacting, breeding.....	575		"drunk bread" disease, notes.....	842	
(See also Cows, Calves, etc.)			foods, analyses, N.Dak.....	661	
Cauliflower—			leaf beetle, life history and control.....	857	
club root, notes.....	241		mildew in France.....	243	
fertilizer experiments, Ill.....	532		rust fungi, teleutospore formation.....	745	
leaf spot or ring spot, notes.....	542		rusts in Canada.....	51	
Cay, crossing experiments.....	464		Cereals—		
<i>Cecidomyia destructor</i> . (See Hessian fly.)			culture experiments, Wash.....	736	
Cedar, incense, oils of.....	607		hybridization experiments, Oreg.....	228	
Cedarwood oil, larvicidal value.....	359		insects affecting.....	651	
<i>Cedestis gyssetiella</i> , notes.....	855		laboratory manual.....	598	
Celery—			statistics, international.....	290	
blight, distribution.....	49		varieties, Wash.....	736	
disease, description, Mich.....	744		(See also Grain and specific kinds.)		
heart rot, studies.....	244		<i>Cerium</i> , effect on permeability.....	34	
leaf spot, studies.....	350		Cestodes, avian, new species.....	281	
seeds, growing in Canada.....	635		Chaetodiplodia, nonvalidity of genus.....	242	
Cell membranes, chemistry and structure.....	626		<i>Chaetomidium barbatum</i> n.sp., description.....	226	
Cellulose—			<i>Chaetopsis anea</i> , notes.....	360	
destruction by fungi.....	136		Chagas disease in Argentina, studies.....	580	
for laying hens, Pa.....	179		<i>Chalcis hamnari</i> n.sp., description.....	66	
waste liquors as a source of potash.....	328		Chalk, effect on soil fertility.....	221	
<i>Celaeta empres</i> as a host of eelworm.....	349		<i>Chamaecrista diphylla</i> , culture, P.R.....	756	
Cement—			<i>Chamaecyparis obtusa</i> wood, essential oil of.....	802	
asphalt, penetration tests, U.S.D.A.....	685		Charbon. (See Anthrax.)		
fume as a source of potash.....	328		Charlock. (See Mustard, wild.)		
use in farm structures.....	787		Chayote, notes.....	835	
vats, coatings for, Cal.....	287		Cheese—		
Centrosema—			composition and characteristics.....	380	
plumieri, fertilizing value.....	34		curing. (See Cheese, ripening.)		
pubescens, culture, P.R.....	786		Edam, composition and control.....	273	
<i>Cephaeleuros viridescens</i> , notes.....	55, 249, 744		Gouda, composition and control.....	273	

<b>Cheese—Continued.</b>	<b>Page.</b>	<b>Chestnut—</b>	<b>Page.</b>
Grana, manufacture.....	572	bark disease in Vermont.....	849
Königsberg, analyses.....	572	bark disease on freshly fallen	
making experiments.....	875	nuts.....	846
making, high v. low testing		bark disease threatening Pacific	
milk for.....	473	States.....	854
manufacture.....	573	blight, control by injection of	
manufacture in South America.	572	chemicals.....	546
moisture content, law regulat-		blight, dissemination by in-	
ing.....	273	sects.....	448, 853
Nattofu, manufacture and com-		blight fungus, notes, N.C.....	49
position.....	574	blight, life history and mor-	
paraffining.....	474, 574	phology, Pa.....	157
Parmigiano, manufacture.....	474	blight parasite and other chest-	
ripening.....	573	nut fungi in Japan.....	846
ripening, lactic acid bacteria in.	76	blight, studies.....	545
soft, manufacture, N.Y.Cornell.	184	blight, studies, Pa.....	154
Swiss, ripening.....	574	seeds, reserve material in.....	427
whey, paraffining.....	474	<b>Chicken—</b>	
Chemical analysis, treatise.....	711	mites, destruction.....	682
<b>Chemistry—</b>		pox, complement fixation in.....	877
agricultural, progress in.....	311	pox, immunization, Cal.....	274, 784
animal, progress in.....	311	pox, secondary invader.....	421
colloid, handbook.....	801	<b>Chickens—</b>	
household, text book.....	458	grit for.....	377
International catalogue.....	407	poisoning with rose chafer.....	655
organic, treatise.....	801	testis, interstitial cells in.....	384
physiological, progress in.....	187	(See also Fowls, Poultry, etc.)	
physiological, text-book.....	563, 607	<b>Chicks—</b>	
technical, treatise.....	801	feeding experiments, Ky.....	871
text-book.....	599	feeding experiments, N.C.....	872
treatise.....	407	feeding experiments, N.J.....	176
yearbook.....	494	mortality in, N.C.....	881
<i>Chenopodium album</i> , analyses, N.		<b>Chicory, studies.....</b>	<b>427</b>
Dak.....	39	<b>Children—</b>	
<i>Chenopodium</i> oil—		diet and care of.....	361
effect on circulation and res-		food requirements, U.S.D.A.....	561
piration.....	476	nutrition of.....	561
effect on intestinal contrac-		sugar in diet of.....	164
tility.....	381	(See also School children.)	
<i>Chermes</i> spp., biology.....	854	<b>Children's gardens. (See School gar-</b>	
<i>Chermes</i> , studies and bibliography..	551	dens.)	
<b>Cherries—</b>		<b>Chilies. (See Pepper.)</b>	
cover crops for, Oreg.....	281	<i>Chilo infuscatellus</i> , notes.....	758
dried, microbiology.....	400	<i>Chilocorus bipustulatus</i> , introduc-	
handling and shipping, U.S.		tion into California.....	361
D.A.....	534	<i>Chilosia</i> sp., notes.....	856
picking and handling.....	437	Chinch bug, new egg parasite of.....	66
pollination.....	233, 341	<b>Chionaspis—</b>	
standard package for.....	438	<i>furfura</i> . (See Scurfy scale.)	
<b>Cherry—</b>		<i>pinnifolia</i> , notes.....	757
bacterial canker, notes.....	351	Chironomidae of Illinois.....	654
blight, notes.....	648	Chloral hydrate—	
blister disease, notes.....	543	toxicity toward plants.....	526
brown rot, notes.....	241	vapor, larvicidal value.....	359
by-products, utilization, U.S.		Chlorates, determination.....	715
D.A.....	808	Chlorid of lime, purification of water.	86
leaf beetle, life history, U.S.		<b>Chlorids—</b>	
D.A.....	756	determination in body fluids.....	507
leaf diseases, treatment, N.Y.		determination in cheese.....	807
Cornell.....	747	excretion as affected by water	
sawfly leaf miner, studies, N.Y.		drinking.....	763
State.....	657		
sawfly leaf miner, studies, U.S.			
D.A.....	458		
worm, ugly nest, notes.....	752		

# INDEX OF SUBJECTS.

941

	Page.		Page.
Chlorin—		Citrus—	
determination in vegetable	410	butterfly, notes.....	851
matter.....		canker, investigations, Fla.....	447
disinfecting value as affected by		canker, notes.....	649, 848
alum.....	885	diseases in Isle of Pines.....	446
disinfection of water by.....	885	diseases, studies, Cal.....	446
<i>Chlorochroa uhleri</i> , notes.....	752	fruit stain, notes.....	354
Chlorophyll—		fruits, cover crops for.....	344
function of.....	30	fruits, cover crops for, P.R.....	736
role in higher plants.....	525	fruits, culture in Philippines.....	635
<i>Chloropisica notata</i> , hibernation.....	254	fruits, handling and shipping,	
Chlorosis of plants—		U.S.D.A.....	235
notes.....	525	fruits, improvement by bud se-	
studies, Conn.State.....	52	lection.....	740
<i>Chlorotettix</i> n.spp., descriptions.....	255	fruits, insects affecting.....	60, 349, 652
Cholesterin—		fruits, insects affecting, Cal.....	449
synthesis of.....	168	fruits, methods and cost of dis-	
variations during inanition and		tributing.....	835
feeding experiments.....	258	fruits, mulching experiments.....	740
Chondriosomes in epidermal cells of		fruits, new genus from Austr-	
<i>iris germanica</i> .....	524	lia.....	235
Chop feed, analyses.....	663	(See also Oranges, Lemons,	
<i>Chorizandra</i> sp., poisoned bait for.....	358	etc.)	
<i>Chortophila trichodactyla</i> attacking		gummosis, description.....	353
cucumbers.....	454	mealy bug, remedies.....	255
Chromogens, vegetable, oxidation and		mealy bug, studies, Cal.....	162
reduction in.....	32	mildew, notes.....	649
Chromolucites, pigments of.....	33	mottled leaf, notes.....	353
Chromosomes, function in heredity.....	527	nursery stock diseases, Cal.....	240
<i>Chrysanthemum frutescens</i> as a host		pollen, long-distance shipment of	
of telworm.....	349	powdery mildew in southern	
<i>Chrysanthemum</i> midge, notes.....	251	California.....	447
<i>Chrysanthemums</i> —		seedlings as affected by irriga-	
evolution.....	237	tion water, Cal.....	235
varieties, U.S.D.A.....	232	white fly. (See White fly.)	
<i>Chrysomphalus</i> —		withertip, notes.....	354
<i>dictyospermi pinnulifera</i> , reme-		<i>Cladospodium</i> —	
dies.....	552	<i>citri</i> , notes.....	446
<i>Acus</i> (acnidum). (See Florida		<i>fulvum</i> , notes.....	841
red scale.)		<i>Clasterosporium putrefaciens</i> , notes.....	350
<i>Chrysomya macellaria</i> . (See Screw-		<i>Claviceps</i> —	
form.)		<i>paspali</i> , toxically, Miss.....	676
<i>Chrysophycta endobiotica</i> , notes....	241	<i>purpurea</i> , notes.....	845
Churches, country, conference on.....	297	Clay, colloidal, notes.....	816
Churns, tests.....	590	Clematis stem rot and leaf spot,	
Cicada, periodical—		studies, N.Y.State.....	249
life history and bionomics, Mo....	764	Clemson College, notes.....	199
notes.....	752	Climate—	
<i>Cicer aristinum</i> , acid secretion of....	525	and cropping systems, correla-	
<i>Cicuta</i> spp., chemistry and toxicol-		tion.....	603
ogy, Nev.....	185	changes in.....	14
Cider press pulp, studies.....	256	effect on crop systems and farm	
Cinex, studies.....	857	operations.....	308
Cinchona—		effect on pecans, Ga.....	151
industry in Netherlands East		effect on soil temperature.....	319
India.....	239	of Canada.....	208
copo seed bed disease.....	749	of Egypt.....	413
<i>Citrachia sorghi vulgaris</i> , inocula-		of Hertfordshire.....	320
tion on Guinea corn.....	644	of Pennsylvania in 1682,	
<i>Citropsilus ostenbosus</i> n.sp., descrip-		U.S.D.A.....	414
tion.....	363	of State College, Pa.....	115
Cirrus bands and the aurora, U.S.		relation to agriculture in Cali-	
D.A.....	117	fornia, U.S.D.A.....	114
Citricola scale, notes.....	255	relation to soil formation.....	514
Citriculture, summer practice course..	292	(See also Meteorology.)	

Climatic subdivisions—	Page.		Page
of United States.....	14	<i>Coccobacillus acridiorum</i> , inoculation	
of United States, U.S.D.A.....	413	of locusts with.....	554
Climatological data. (See Meteorological observations.)		<i>Cocophagus</i> n.spp., descriptions.....	557
Climatology of Quebec.....	715	<i>Coccus</i> —	
(See also Meteorology.)		<i>citricola</i> , notes.....	255
<i>Ckitoria cojanifolia</i> , fertilizing value.....	34	<i>hesperidum</i> . (See Scale, soft.)	
<i>Clonorchis sinensis</i> , life history and morphology.....	858	<i>Cochilomyia</i> ( <i>Chrysomyia</i> ) <i>macelaria</i> , notes.....	758
Clothing problem in United States Navy.....	167	<i>Cochylis ambiguella</i> —	
Cloud, aurella alto-cumulus, U.S.D.A.....	615	biology and remedies.....	654
Clover—		monograph.....	583
as affected by sulphur.....	540	remedies.....	65
as affected by sulphur, U.S.D.A.....	625	<i>Cochylis</i> moth—	
bitter, as a green manure, Cal.....	36	destruction by heat.....	653
bloat, treatment, Ky.....	581	notes.....	551
bur, culture, Ga.....	138	Cockerels, feminized.....	570
bur, notes, U.S.D.A.....	139	Cocoa, imports into United States.....	45
crimson, culture, Ga.....	138	Coconut—	
crimson, culture experiments, Miss.....	227	bud rot, notes.....	50, 943
crimson, inoculation experiments, Ga.....	138	cake, analyses.....	265
crimson, liming experiments, N.J.....	132	cake, effect on milk and butter.....	570
culture experiments, Wash.....	736	disease in New Caledonia.....	55
cut, analyses, Mass.....	467	disease in New Hebrides.....	56
cut, analyses, N.H.....	169	diseases, notes.....	241, 348, 442, 749
effect on milk and butter.....	570	meal, analyses, N.J.....	665
fertilizer experiments.....	517	oil, digestion and absorption.....	597
fertilizer experiments, Mich.....	723	palm leaf roller in Hawaii.....	570
hay, analyses.....	164	palms, abnormalities of.....	138
insects affecting.....	251	Coconuts—	
liming experiments, Pa.....	133	cover crops for, P.R.....	738
meal for pigs.....	869	culture.....	430
Mexican, analyses.....	767	fertilizer experiments.....	31
red, anthracnose of, Pa.....	155	insects affecting.....	349, 652, 746, 81
red, breeding experiments, Can.....	34	ripening, chemical changes in.....	34
red, culture experiments, Can.....	34	spraying experiments.....	1
red, fertilizer experiments, Mass.....	622	Cod liver meal, composition and feeding value.....	51
red, liming experiments.....	725	Codling moth—	
red, liming experiments, Pa.....	133	egg parasites in Turkestan.....	21
seed, germination tests, Pa.....	143	life history.....	21
sour, as a cover crop for citrus.....	344	remedies.....	6
stem rot, studies, Ky.....	541	remedies, N.J.....	14
sweet. (See Sweet clover.)		remedies, N.Mex.....	72
varieties, Wash.....	736	remedies, Oreg.....	28
Club work in Indiana.....	599	tachinid parasites of.....	65
<i>Clytia</i> ( <i>Cochylis</i> ) <i>ambiguella</i> , monograph.....	553	<i>Coffea amara</i> , studies.....	34
Coal—		Coffee—	
ash from iron industry, fertilizing value.....	725	as affected by storage.....	66
tar as a coating for concrete.....	889	botanical studies.....	55
Coat color. (See Color.)		diseases, notes.....	540, 545, 74
Coccaceae, bibliography and classification.....	477	grains, changes in due to Aspergillus.....	54
Coccids—		green manure crops for.....	24
of Great Britain.....	552	hybrids, notes.....	4
of New York.....	752	imports into United States.....	349, 54
of Philippines.....	552	insects affecting.....	349, 54
of west Africa.....	851	layering.....	54
Coccidia, chromosome cycle.....	458	leaf disease in Uganda.....	54
Coccinellids, aphid feeding, studies.....	555	making devices, efficiency.....	16
		Mantsaka, studies.....	54
		nematodes affecting.....	5
		pulp, analyses and fertilizing value.....	75
		useful and harmful constituents.....	16
		witherip, notes.....	5

	Page.		Page.
Colechids, detection in water	410	Concrete—	
Cold—		aggregates for	87, 485, 685
effect on plants	223	as a protection for wood-stave	
effect on trichinae, U.S.D.A.	680	pipe	890
frames, construction, Wash.	494	coating with tar	889
frames, construction and management, N. Y. State	40	drain tile as affected by alkali	87, 584
frames, construction and management, Wash.	787	drain tile, construction	685
storage, effect on fruit fly, U.S.D.A.	554	fence posts, construction	487, 685
storage of vegetables and fruits (See also Temperature, low.)	637	flat slabs, design	685
<i>Coleophora</i> n.spp., descriptions	553	for sanitary farm improvements	273
Coleoptera—		grain elevators, design	685
of West Indies	556	highway bridges, specifications	685
olfactory sense	254	reinforced, shrinkage and time	
<i>Coleus hybridus</i> , polarity	626	effects in	787
Colleges. (See Agricultural colleges.)		resistance to wear	484
<i>Colletotrichum</i> —		strength as affected by temperature	889
<i>agaces</i> , notes	442	tests of strength	685
<i>cajani</i> , notes	52	use on farms	485
<i>cradicickii</i> , notes	349	viaduct, construction	88
<i>galatum</i> , notes	49	Conifer diseases in Italy	599
<i>glauosporioides</i> , effect on citrus fruits	354	Conifers, oils of	607
<i>glauosporioides</i> , notes	416, 644, 750	Coniferous seedlings, root rot of	548
<i>glauosporioides</i> , notes, Cal.	241	Conifers, western, destructive distillation	509
<i>incornatum</i> , notes	540	<i>Coniophora cerebella</i> , studies	547
<i>Indemuthianum</i> as affected by cold, U.S.D.A.	538	<i>Coniothecium chomatosporum</i> , notes	543
<i>Indemuthianum</i> , notes	645	<i>Coniothyrium</i> —	
<i>lycopersici</i> on tomatoes	53	<i>fuckelii</i> , notes	55
n.s.p. on <i>Schinus molle</i>	242	<i>fuckelii</i> , relation to apple	
<i>nigrum</i> , notes	442	canker	653
sp. on snapdragon	841	n.spp., descriptions	242
spp. as affected by temperature	542	Connecticut—	
<i>Colletotrichum</i> and <i>Gloeosporium</i> on chili, identity	50	College, notes	98
Colloids—		State Station, food and drug reports, index	458
handbook	801	State Station, report	95
importance in soils	816	Conserves for the army	365
of clay, notes	816	<i>Contarinia pyritora</i> , notes	752
of soils, treatise	515	Cookery for campers, U.S.D.A.	46
<i>Colpria calcitrator</i> , development	363	Cooking—	
Color inheritance—		book	794
in guinea pigs	464	by electricity in cafeteria	861
in rabbits	370, 466	text-book	395
Coleimeter—		utensils, aluminum alloys for	257
Dubosky, converting into nephelometer	503	Copper—	
observations, source of error in	805	carbonate, fungicidal value	745
Coloring matters, photodynamically active, effect on plant cells and tissues	223	carbonate, insecticidal and larvicidal value	359
Colts, draft, developing, Pa.	175	detection	112
<i>Conandra umbellata</i> , parasitism, U.S.D.A.	242	detection in water	410
Commercial organizations in United States	290	determination	611
Complement fixation, nonspecific, studies	779	methods of analysis	13
Composite, pollen-presentation mechanism in	727	sprays, fungicidal value	243, 643
<i>Conchita peluda</i> , culture, P.R.	738	sprays, hot, insecticidal action	243
		tube, crushing by lightning, U.S.D.A.	118
		Copperas. (See Iron sulphate.)	
		Copra, composition and nutritive value	565
		<i>Coprinus micaceus</i> , transmission by tree crickets	653
		<i>Coquillettina plankii</i> n.g. and n.s.p., description	360
		<i>Corchorus olitorius</i> , culture in Egypt	232

Corn—	Page.	Corn—Continued.	Page.
analyses.....	630	leaf blight, notes.....	344
analyses, Wyo.....	667	liming experiments, Ohio.....	320
and cob, ground, analyses.....	767	liming experiments, Pa.....	132, 120
and cob meal, analyses, N.J.....	665	lye hulling for hominy.....	69
beetle, notes.....	754	meal, analyses, Mass.....	467
bran, analyses.....	72, 767	meal, analyses, N.J.....	665
bran, analyses, Ind.....	263	meal, analyses, Vt.....	371
bran, analyses, Kans.....	169	meal, analyses, Wyo.....	469, 698
bran, analyses, N.J.....	665	notes, Vt.....	327
bran, analyses, Tex.....	467	pollination studies, Ariz.....	222
breeding experiments, N.J.....	144	popability, N.J.....	141
chop, analyses.....	263	prices and shrinkage, Ill.....	277
chop, analyses, Kans.....	169	rusts in Canada.....	51
chop, analyses, Tex.....	467	seed, germination tests, Ohio.....	850
cockle, effect on baking quality		seed, germination tests, Pa.....	120
of wheat, U.S.D.A.....	558	seed, selecting, curing, and	
cost of production, N.J.....	137	testing, N.Dak.....	35
cracked, analyses, N.J.....	665	seed, storing, Pa.....	129
crossing experiments.....	529	silage, (See Silage.).....	
crossing experiments, Nebr.....	228	silk beetle, notes.....	555
culture, Colo.....	630	storage, Kans.....	320
culture, Kans.....	529	sucrose from.....	112
culture, S.C.....	694	sugar content as affected by	
culture, U.S.D.A.....	529	detasseling.....	494
culture, Vt.....	337	translocation of mineral con-	
culture experiments.....	431, 434	stituents, U.S.D.A.....	477
culture experiments, Can.....	34	treatise.....	329
culture experiments, N.Mex.....	735	tropical varieties.....	596
culture experiments, U.S.D.A.....	228	varieties.....	431, 434
culture in South Africa.....	227	varieties, Cal.....	227
dry rot, notes.....	242	varieties, N.Mex.....	735
ear worm, notes.....	62	varieties, Pa.....	129
ear worm, notes, Ariz.....	232	varieties, U.S.D.A.....	229, 433
ear worm, remedies.....	63	viability and vigor as affected by	
ears, soft, ensiling.....	371	position on cob, N.J.....	124
effect on composition of fol-		viability tests, N.J.....	145
lowing wheat crop.....	230	water requirements, Nebr.....	273
effect on milk and butter.....	570	water requirements, Wash.....	720
feed meal, analyses.....	72	yield as affected by sulphur.....	728
feeding value, Tenn.....	867	yields, Nebr.....	228
fertilizer experiments.....	35,		
431, 434, 529, 621, 622		Corn cob, ground.....	
fertilizer experiments, Mass.....	204	analyses.....	767
fertilizer experiments, Mich.....	723	analyses, N.J.....	665
fertilizer experiments, Pa.....	128, 131	effect on soil phosphates, Tex.....	421
fertilizer experiments, Tex.....	421	Cornell University, notes.....	198, 695, 590
flou-beetle, notes, Ariz.....	232	Cornstalk beetle, notes.....	757
for silage, cost of production,		Corpus luteum substance, effect on—	
N.J.....	137	egg production and growth.....	667
for silage, varieties, Pa.....	139	growth and sexual development.....	796
germ, effect on milk and but-		Corrosive sublimate, poisoning of	
ter.....	570	live stock by, N.Dak.....	279
germ meal, analyses, Ind.....	263	Corticium—	
gluten feed, analyses.....	72	salmonicolor, notes.....	448, 819
gluten feed, analyses, Ind.....	263	spp. on rubber.....	744
gluten meal, analyses.....	72, 371	vagum, notes.....	819
growth as affected by alkali		Cotton—	
salts, U.S.D.A.....	125	American, introduction into	
improvement in Uruguay.....	630	Sind.....	257
inbreeding experiments, Nebr.....	228	angular leaf spot, notes, S.C.....	645
inheritance in, Conn.State.....	431	anthracnose, treatment, S.C.....	647
inheritance of alterations in.....	31	aphis, notes.....	548
insects affecting.....	851	Arizona-Egyptian, handling and	
insects affecting, Kans.....	529	marketing, U.S.D.A.....	338
irrigation experiments, Wash.....	721	boll weevil, Arizona wild, bi-	
		ology, U.S.D.A.....	654

# INDEX OF SUBJECTS.

945

Cotton—Continued.	Page.	Cotton-seed—Continued.	Page.
boll weevil, chain drag for, Ala.College.....	65	cold-pressed, analyses, Kans.....	169
boll weevil, control, Ala.College.....	163	cold-pressed, analyses, Tex.....	467
boll weevil, hibernating in cotton seed, Miss.....	857	flour, use in bread making.....	762
boll weevil, pink, notes.....	227	fumigating with carbon bisulphid.....	458
culture, S.C.....	694	hulls, analyses, Ind.....	263
culture in Egypt.....	227	internal disease of.....	645
culture in Eritrea.....	227	meal, ammonification, Pa.....	127
culture in German colonies.....	227	meal, analyses.....	72,
culture in Greece.....	227	263, 371, 426, 506, 727, 767	
culture in Italian Somaliland.....	227	meal, analyses, Ind.....	263
culture in Jubaland.....	227	meal, analyses, Kans.....	169
culture in Nigeria.....	227	meal, analyses, Mass.....	467
culture in Portuguese colonies.....	227	meal, analyses, N.H.....	169
culture in Russian Turkestan.....	227	meal, analyses, N.J.....	665
culture in Uganda.....	227	meal, analyses, Tex.....	467
culture, labor cost in.....	227	meal, analyses, Vt.....	371
culture under irrigation, U.S. D.A.....	229	meal, digestibility in mixed rations, Ga.....	169
disease in island of Nevis.....	542	meal, effect on breeding properties of helpers, Ind.....	775
distance experiments, Miss.....	830	meal, effect on cows.....	279
Durango, culture in Imperial Valley, U.S.D.A.....	434	meal, fertilizing value, Cal.....	219
Egyptian, culture in Southwest, U.S.D.A.....	529	meal, fertilizing value, N.J.....	129
Egyptian, heredity in.....	227	meal for arid soils.....	621
exports, U.S.D.A.....	194	meal, oxidation in soils, Tex.....	420
feeding habits, Ga.....	139	meal poisoning in pigs, U.S.D.A.....	474
fertilizer experiments.....	35, 337	meal, toxicity.....	476
fertilizer experiments, Ga.....	139	meal, toxicity, N.C.....	79
fertilizer experiments, U.S.D.A.....	512	meal, toxicity, U.S.D.A.....	381
growth as affected by fertilizers and soil humidity.....	337	oil, hydrogenated, digestibility.....	659
improvement by selection.....	227	oil, hydrogenated, properties.....	9
industry of Leeward Islands.....	227	oil, hydrogenation.....	10
insects affecting, 349, 539, 549, 652.....	851	oil soap as a substitute for whale oil soap.....	250
leaf diseases in St. Kitts.....	539	pressure in warehouses.....	687
leaves, formation of ascidia in.....	429	Cottonwood borer beetle parasite.....	66
lessons for rural schools, U.S. D.A.....	293	Cottony cushion-scale in France.....	850
marketing association, by-laws.....	288	Coumarin—	
Sea Island, culture in West Indies.....	227	effect on plant growth, Tex.....	128
Sea Island, improvement by selection.....	631	effect on wheat plants.....	325
shedding.....	227, 844	Country—	
shedding, S.C.....	643	girls, treatise.....	290
spacing experiments, U.S.D.A.....	229	homes, electric light and power for.....	488
spraying for boll weevil, Miss.....	830	homes, sewage disposal in.....	88
stalk cutter, description, Ala. College.....	163	homes, water supply and sewage disposal for.....	286, 790
trade, manual.....	595, 691	life, conference on.....	297
varieties.....	831	life week at Ohio State University.....	895
varieties, Miss.....	830	County experiment farm law, Ohio.....	294
wilt and root knot, notes, S.C.....	643	Cover crops—	
wilt, notes.....	50	for apple orchards, Pa.....	148
worm, notes.....	62	for berries, Wash.....	294
Cotton-seed—		for citrus fruits.....	344
cake, analyses, Kans.....	169	for Porto Rico, P.R.....	736
cake, analyses, Tex.....	467	notes, Mass.....	138
cake, effect on milk and butter.....	570	Cow—	
cake v. cold-pressed cotton-seed cake for cattle, Ariz.....	170	champion dairy.....	269, 472
cold-pressed, analyses, Ind.....	263	testing associations in New Hampshire.....	472
		Cowpea—	
		weevil, notes.....	754
		wilt and root knot, notes, S.C.....	643

	Page.		Page.
<b>Cowpeas—</b>		<b>Cream—Continued.</b>	
as a cover crop, P.R. ....	738	production and inspection in	
as a green manure, U.S.D.A. ....	230	New England. ....	390
as affected by pod position, N.J. ....	134	ripened, bacteria in. ....	572
culture, Colo. ....	630	separators, description. ....	891
culture, S.C. ....	694	separators, operation. ....	891
culture experiments, Miss. ....	227	separators, tests. ....	560
effect on soil, U.S.D.A. ....	420	<b>Creamery—</b>	
feeding value, Tenn. ....	867	experimental, at Grove City,	
varieties, Miss. ....	228	Pennsylvania. ....	458
<b>Cowpox, complement fixation in. ....</b>	<b>877</b>	refuse, disposal. ....	89
<b>Cows—</b>		<b>Creatin—</b>	
care and management, Ohio. ....	471	determination in muscle and	
conformation and milk yield. ....	379	other organs. ....	567
cost of feeding by breeds, N.J. ....	181	origin. ....	567
cost of keeping. ....	472	<b>Creatinin, origin. ....</b>	<b>567</b>
cost of raising, Mass. ....	671	<b>Creosote—</b>	
cost of raising, Ohio. ....	470	examination. ....	508
dairy, rules for testing, Mass. ....	182	insecticidal and larvicidal value	559
factors affecting growth and		Cresol emulsions, tests. ....	750
dairy qualities, Mo. ....	378	Crimson clover. ( <i>See</i> Clover.)	
feeding, Wash. ....	269, 694	<i>Crithidia leptocoridis</i> , morphology	
feeding experiments. ....	471,	and life history. ....	555
683, 670, 671, 878		<i>Croesus castaneæ</i> n.sp., description. ....	452
feeding experiments, Cal. ....	269	<b>Cronartium—</b>	
feeding experiments, Ky. ....	670	<i>comandra</i> and <i>Peridermium py-</i>	
feeding experiments, Mich. ....	773	<i>rifforme</i> , identity. ....	539
feeding experiments, N.J. ....	180	<i>quercuum</i> and <i>Peridermium</i>	
feeding experiments, N.Mex. ....	774	<i>harknessii</i> , association. ....	849
feeding experiments, Ohio. ....	670	<i>ribicola</i> , parasite of. ....	751
feeding experiments, Pa. ....	181, 182	<i>ribicola</i> threatening Pacific	
feeding experiments, Wash. ....	773	States. ....	554
feeding standards for. ....	670	<b>Crop—</b>	
high-producing, notes. ....	472	growth as affected by fertilizers.	517
large v. small for milk produc-		reports, U.S.D.A. ....	91
tion, Wash. ....	773	290, 392, 595, 690, 899	
official tests, rules for, Cal. ....	76	residues, analyses and use, S.C. ....	512
open shed v. regular stabling		rotations. ( <i>See</i> Rotation of	
for, Pa. ....	181, 182	crops.)	
records. ( <i>See</i> Dairy herd rec-		yields, relation to weather. ....	319, 418
ords.)		<b>Cropping systems and climate, cor-</b>	
soiling crops v. silage for. ....	671	relation. ....	603
<b>Crab apple blight, notes. ....</b>	<b>648</b>	<b>Crops—</b>	
<b>Crambus—</b>		choice of, Wash. ....	804
<i>hortellus</i> , notes. ....	756	improvement, Mich. ....	755
<i>luteolellus</i> , notes. ....	752	production in Ireland. ....	261
<b>Cranberries—</b>		water requirements. ....	306
culture in Wisconsin. ....	42	Cross-breeding, variations under. ....	864
fertilizer experiments. ....	834	<b>Crotalaria—</b>	
fertilizer experiments, Pa. ....	150	<i>retusa</i> , culture, P.R. ....	738
<b>Cranberry—</b>		spp., fertilizing value. ....	24
bogs, temperature conditions in.	715	Crude fiber. ( <i>See</i> Cellulose.)	
fruit worm, notes. ....	851	<i>Cryptococcus farciminosus</i> , notes. ....	480, 585
girdler, notes. ....	756	<i>Cryptomeria japonica</i> leaves, essen-	
leaf miner notes. ....	851	tial oil of. ....	802
tip worm, notes. ....	851	<b>Cryptorhynchus—</b>	
<b>Cream—</b>		<i>lapathi</i> , remedies. ....	658
contests, U.S.D.A. ....	874	n.sp. on cassava. ....	85
cooling. ....	572	sp. affecting sugar cane. ....	556
examination, Me. ....	76	<b>Cucumber—</b>	
handling, Pa. ....	79	angular leaf spot, studies, U.S.	
methods of analysis, U.S.D.A. ....	713	D.A. ....	442
pasteurization costs, U.S.D.A. ....	380	beetle, western 12-spotted, notes.	857
pasteurization for butter mak-		beetles, notes. ....	656
ing, Ind. ....	775	worm, studies, Ky. ....	855

# INDEX OF SUBJECTS.

947

	Page.	Dairy—Continued.	Page.
Cucurbit bacterial wilt, dissemination, U.S.D.A.	244	laboratory guide.....	571
Culicr spp. in Bahamas.....	553	products, inspection and distribution in New England.....	380
Culicidae. (See Mosquitoes.)		products, standardization and branding.....	381
Culture media, hydrogen ion concentration in.....	136	sewage, purification.....	590, 687
Cumulus over a fire, U.S.D.A.	413	Dairying—	
Cuprous oxid, determination in Fehling's solution.....	611	function in agriculture.....	305
Current—		treatise.....	670
fruit weevil attacking blueberries, Me.....	852	<i>Dalbergia latifolia</i> , notes.....	240
leaf diseases, treatment, N.Y. Cornell.....	747	<i>Dasychira pudibunda</i> , notes.....	63
mildew, notes.....	648	<i>Dasyphora pratorum</i> , hibernation.....	254
Currents, culture, N.Y.State.....	42	Date palms, transplanting experiments, U.S.D.A.....	231
Current-meter—		Dates of Egypt and Sudan, U.S.D.A.	43
gaging stations, equipment for, meter, use in irrigation canals, U.S.D.A.	84	<i>Davainea n.spp.</i> in fowls.....	281
<i>Juncus</i> spp., seed germination, Pa.	281	Delaware—	
<i>Utricularia cuneulifolia</i> , reproductive and host habits.....	155	College, notes.....	295, 797
Curworm, black, notes.....	358	Station, notes.....	797
Cutworms—		<i>Delphas saccharivora</i> , notes.....	753
in Hawaii.....	59	Delphinin, studies.....	709
injuriosus to tobacco.....	453	<i>Deltocephalus n.spp.</i> , descriptions.....	255
notes.....	251, 360	<i>Dematophora necatrix</i> on apple and gooseberry.....	49
poisoned bait for.....	358	<i>Demoder folliculorum</i> , remedies, Cal.	275
Cyanid—		<i>Dendrocalamus strictus</i> , culture experiments, U.S.D.A.....	232
effect on locust borer and locust tree.....	757	<i>Dendrolymus pini</i> , metamorphosis.....	361
fumigation, effect on bud formation, N.J.....	143	Denitrification in soils.....	423
Cyanids, detection in water.....	410	Department of agriculture, (See United States Department of Agriculture.)	
Cyanin, studies.....	709	Dermatitis in horses, Cal.....	274
Cyanophyceae, distribution in soils.....	513	Dermatobia, reproductive and host habits.....	358
<i>Cylas formicivorus</i> , notes.....	65	<i>Desmodium</i> —	
<i>Cylindrosporium pami</i> as affected by cold, U.S.D.A.....	538	<i>adscendens</i> , culture, P.R.....	736
Cylinic robinia, remedies.....	757	<i>incanum</i> , culture, P.R.....	736
<i>Cynomyia ludoviciana</i> , control, Nebr.	57	Desmometopa, commensalism in.....	359
Cypress, southern, U.S.D.A.....	40	Dew, measurement.....	510
Cyrtopogon—		Dewberries—	
<i>candidus</i> , notes.....	750	culture, N.Y.State.....	42
<i>impomae pandurana</i> , studies, Del.	156	phyllody of corolla in, N.J.....	143
<i>Cyrtospora</i> spp. on plums.....	648	Dexlida, new, in South America.....	65
Dafodils, treatise.....	741	Dextrin—	
Dahlia, phyllody of corolla in, N.J.....	143	determination in food products.....	205
Dairies, culture.....	41	products, examination.....	11
Dairy—		use in food products.....	167
appliances and utensils, Ky.....	571	Dextrose—	
bacteriology at Berne Congress.....	76	determination.....	611
barns, construction, Wash.....	789	effect on carbon dioxide production, N.J.....	127
barns, plans.....	487	Dhanri, notes.....	239
by-products, pasteurization, N.Y. State.....	673	Diabetes, studies.....	462
experimental work in Pennsylvania.....	498	<i>Diabrotica</i> —	
farm, small, developing, Wash.....	494	<i>soror</i> , notes.....	656, 657
herd records.....	289, 472	<i>trivittata</i> , notes.....	656
herd records, N.J.....	181	Diachasma—	
herd records, Pa.....	182	<i>pilosipes</i> , notes.....	455
herd records, Wash.....	774	<i>tryoni</i> , notes.....	556
		<i>Diamesa mendota</i> n.sp., life history.....	651
		Diamond-back moth, remedies.....	654
		<i>Diaphania nitidalis</i> . (See Pickle worm.)	

<i>Diaporthe</i> —	Page.	<i>Diplo-</i>	Page.
<i>ambigua</i> , notes.....	543	<i>maydis</i> , notes.....	342
<i>batatas</i> , studies, Del.....	156	<i>nataiensis</i> , notes.....	346
<i>parasitica</i> , life history and morphology, Pa.....	157	<i>palmicola</i> , notes.....	342
<i>Diaprepes abbreviatus</i> , notes.....	753	<i>pinca</i> , notes.....	342
Diarrhea—		sp., notes.....	247
bacillary white, in chicks, Mass.....	189, 275, 387	<i>tubercicola</i> , studies, Del.....	750
in chicks, treatment, N.C.....	881	<i>Diplodictella</i> , nonvalidity of genus.....	242
in infants, relation to heat.....	462	Dipping—	
<i>Diaspis pentagona</i> —		theory and practice.....	186
control in Italy.....	851	vals, construction, U.S.D.A.....	473
parasites of.....	456	<i>Diprion (Lophyrus) similis</i> in Connecticut.....	360
<i>Diastrophus fragariae</i> n.sp., description.....	362	Diptera—	
<i>Diatraea</i> —		of West Indies.....	45
<i>saccharalis</i> . (See Sugar cane borer.)		photographic atlas.....	664
<i>striatella</i> , notes.....	758	Disaccharids, enzymatic synthesis.....	802
<i>striatella</i> , parasites of.....	856	Diseases—	
<i>Dicranomyia folliculiculator</i> n.sp., description.....	554	air-borne, relation to ventilation.....	192
<i>Dictyocaulus flarfa</i> , studies, Cal.....	274	insect-borne, in Pan America.....	734
<i>Didonerus minutus</i> , notes.....	754	of animals. (See Animal diseases.)	
<i>Didymella applanata</i> , notes.....	55	of plants. (See Plant diseases.)	
( <i>Dielia</i> ) <i>Compsoeris dorsata</i> , notes.....	455	Disinfectants—	
Diet—		bactericidal properties.....	675
during growth, essential factors in.....	368	tests.....	580
effect on blood sugar.....	562	<i>Dissosteira longipennis</i> , notes.....	159
effect on growth of the brain.....	602	U.S.D.A.....	159
effect on nitrogen and chlorine content of perspiration.....	662	Distillers' grains, dried—	
effect on secretion of urine in infants.....	763	analyses.....	72, 263, 596, 767
for an orphanage.....	462	analyses, Ind.....	263
mineral constituents of.....	563	analyses, Mass.....	467
of southern wage-earners' families.....	259	analyses, N.H.....	169
of Swiss workingmen.....	681	analyses, N.J.....	665
relation to pellagra.....	258, 269, 764	analyses, Vt.....	371
(See also Food.)		for hogs, Ky.....	665
Digestion experiments—		Distillery slop for hogs, Ky.....	666
with adults and infants.....	167	Ditches, machines for cleaning, U.S.D.A.....	189
with men.....	650	Diuresis—	
with steers, Ga.....	169	pituitary factor in.....	76
with young cattle.....	372	relation to milk flow, U.S.D.A.....	570
Digitals as affected by composition of soils.....	18	Dodders, clover, germination of seed, Pa.....	153
<i>Digitals purpurea</i> , assimilation of mineral salts by.....	135	Dog diseases, etiology and vaccination.....	573
Dihydroxystearic acid—		Dogs—	
effect on plants.....	325	as carriers of parasites and disease.....	250
effect on plants, Tex.....	126	intestinal parasitism, complement fixation in.....	482
Dimethylamin, insecticidal and larvicidal value.....	359	<i>Dolichos lablab</i> —	
<i>Dioryctria schützeella</i> , notes.....	855	culture and characteristics, U.S.D.A.....	426
Diphtheria—		culture in Egypt.....	232
bacilli in birds.....	83	Dolomite, fertilizing value, Pa.....	157
toxin, concentration and purification.....	579	Domestic art or science. (See Home economics.)	
Diphtheroid bacillus in horses and calves.....	186	<i>Dothiorhiza</i> —	
<i>Diplocystis schneideri</i> , chromosome cycle.....	458	<i>gregaria</i> on walnuts, Cal.....	447
		sp. on walnuts.....	56, 257
		Dourine—	
		in horses, diagnosis.....	186, 285
		in Northwest.....	185

	Page.		Page.
Dragonflies, food habits.....	549, 550	Dysentery, chronic bacterial. (See	
Drainage—		John's disease.)	
ditches, machinery for, U.S.		Earth, internal structure, U.S.D.A....	614
D.A.....	189, 583	Earthquakes in United States, U.S.	
ditches, opening with dynamite,		D.A.....	615
Pa.....	125	East coast fever. (See African	
effect on yield of sugar cane....	588	coast fever.)	
in Iowa.....	885	<i>Eccoptogaster (Scolytus) rugulosus</i>	
in Italy.....	786	affecting locusts.....	361
in North Carolina.....	885	<i>Echinocactus wislizeni</i> , accumulation	
in North Carolina, N.C.....	585	and destruction of acid in.....	730
of alkali soils, Cal.....	283	<i>Echinocasmus perfoliatus</i> in pigs....	480
of irrigated lands.....	86, 483	<i>Echinoclonia crus-galli</i> , analyses,	
pumping, cost of.....	585	N.Dak.....	39
tile. (See Tile.)		<i>Echinorhynchus gigas</i> , description ..	280
use of pumps in, U.S.D.A.....	283	Eclampsia, puerperal. (See Milk	
Drawing, agricultural, text-book....	487, 598	fever.)	
Dredges, use in land drainage, U.S.		Ectoparasites injurious to man.....	251
D.A.....	189	Edestin, refractive indexes.....	803
Dried blood—		Education—	
ammonification, Pa.....	127	agricultural. (See Agricultural	
analyses, Ind.....	263	education.)	
availability, N.J.....	130	value to the farmer, Mo.....	393
fertilizing value.....	520	vocational, cultural value.....	897
fertilizing value, Cal.....	219	vocational, in Illinois.....	598
fertilizing value, N.J.....	129	Egg—	
fertilizing value, Pa.....	128, 131	laying contest in British Colum-	
Dried-fruit beetle, notes.....	454	bia.....	470
<i>Drosophila ampelophila</i> . (See Po-		laying contest in Missouri.....	869
mace fly.)		production as affected by pitu-	
Droughts in Union of South Africa..	818	itary substance.....	75
Drugs—		production, feeding for, Mo.....	377
bacteriological examination.....	713	production, illustrated lecture,	
inspection in Connecticut, Conn.		U.S.D.A.....	196
State.....	458	production, improvement by se-	
inspection in Florida.....	762	lection.....	870
inspection in Indiana.....	861	production in hens, Pa.....	176
inspection in Kentucky, Ky.....	761	production in hens, studies.....	869
inspection in North Dakota, N.		production, inheritance in hens....	74, 564
Dak.....	368	production of different poultry	
misbranding, U.S.D.A.....	661	breeds.....	569
Dry farming investigations in United		production of February-hatched	
States.....	34	pullets.....	377
Drylands, life histories.....	557	production, winter cycle in, U.S.	
Duck house, description, N.J.....	177	D.A.....	470
Ducks—		Eggplants—	
care and management.....	377	crossing experiments, N.J.....	146
care and management, U.S.D.A....	569	limitation studies, N.J.....	146
destruction of mosquito larvae....	856	varieties, N.J.....	146
Duodenal regurgitation, effects of....	862	Eggs—	
Durum wheat. (See Wheat, durum.)		color xenia and telephony in....	569
Dust—		composition.....	569
fall in English towns and cities..	15	hatchability, N.J.....	178
from blast furnace gas, analyses....	623	improving quality of, Kans.....	179
prevention, notes.....	484, 890	incubation experiments, Pa.....	179
Duty of water. (See Water, duty.)		marketing cooperatively, N.J.....	178
Dynamite—		meaning of size.....	770
effect on soil, Pa.....	125	preservation.....	470
for heavy clay soils, Kans.....	819	seasonable variation in quality....	669
in soil preparation for alfalfa,		weight in relation to rations,	
Miss.....	228	Pa.....	179
use in rubber culture.....	47	Elaioplasts in monocotyledons and	
Dyomys, notes.....	855	dicotyledons.....	825
<i>Dysodesis farinella</i> , notes.....	855	<i>Elaphodon villosus</i> , notes.....	752
		<i>Elater segestis</i> , notes.....	757

	Page.		Page.
Elder, marsh, analyses, N.Dak.-----	39	Enterohepatitis, infectious. (See	
Electric-----		Blackhead.)	
bake ovens, notes.-----	460	Entomological-----	
currents, effect on transmission		laboratories, new, in Canada.-----	296
of excitation in plants and		Society of America.-----	409
animals.-----	29	Society of British Columbia.-----	657
light and power in country		Entomology-----	
homes.-----	483	economic, progress in.-----	449
niagaras, use in hail protection.-----	208	medical and veterinary, treatise.-----	850
pumping for irrigation.-----	86	<i>Entomospodium maculatum</i> , notes.-----	846
Electricity-----		Enzym action, studies.-----	111
of atmospheric precipitation,		Enzymes-----	
U.S.D.A.-----	413	chemistry of.-----	502
use in agriculture.-----	87, 287, 688	of apples, U.S.D.A.-----	291
use in cafeteria cooking.-----	801	of plants, studies.-----	428, 751
waterfall, U.S.D.A.-----	414	oxidase, notes.-----	711
wind power plant for.-----	191	production and activity of.-----	52
Electroculture experiments.-----	727	(See also Ferments.)	
Electrolytes-----		Eosinophilia, notes.-----	274
exosmosis from plant tissue.-----	731	Eosinophils, investigations.-----	878, 879
measuring conductivity, Mich.-----	732	<i>Ephedrus aestivus</i> n.sp., description.-----	567
Elephants, domestication in Belgian		<i>Ephesia</i> -----	
Kongo.-----	376	<i>cahiritella</i> , notes.-----	754
<i>Eleutheroda dytiscoides</i> in Hawaii.-----	59	<i>kuehniella</i> . (See Mediterranean	
Elevators, cooperative, in Minnesota,		flour moth.)	
Minn.-----	392	<i>Epiblema tedella</i> , notes.-----	855
Elm-----		<i>Epicampes macroura</i> as a paper-mak-	
cluster louse and woolly apple		ing material, U.S.D.A.-----	318
aphis, identity.-----	357	<i>Epidinocarsis pseudococci</i> n.sp., de-	
leaf beetle, notes.-----	752	scription.-----	456
Emmer-----		Epinephrin in fetal pituitary and su-	
culture experiments, U.S.D.A.-----	137	prarenal glands.-----	675
culture under irrigation, Colo.-----	528	<i>Epinotia</i> -----	
varieties, U.S.D.A.-----	733	<i>fasciolana</i> , studies, Me.-----	852
<i>Empria</i> spp., studies, Iowa.-----	758	<i>nanana</i> , notes.-----	855
<i>Empusa muscae</i> , destruction of flies.-----	254	Epithelioma, contagious, in chickens,	
<i>Enchenopa binotata</i> , life history.-----	356	Nov.-----	189
<i>Endothia</i> -----		<i>Epitrix</i> -----	
<i>parasitica</i> , effect of continuous		<i>cucumeris</i> , notes, N.J.-----	158
desiccation on.-----	56	<i>fuscula</i> , remedies.-----	361
<i>parasitica</i> in Japan.-----	848	<i>Erannia tilivaria</i> . (See Lime-tree	
<i>parasitica</i> , persistence of pycno-		winter moth.)	
spores.-----	546	Ergot-----	
<i>parasitica</i> threatening Pacific		of Equidae.-----	508
States.-----	351	of wild rice, studies.-----	444
<i>parasitica</i> , transmission by in-		<i>Eriophyes quadrisetus</i> , notes.-----	450
sects.-----	853	<i>Eriopus floridensis</i> , notes, N.J.-----	158
<i>radicals</i> on <i>Pasania</i> sp. in		<i>Eriosoma</i> -----	
Japan.-----	848	<i>pyri</i> , identity, U.S.D.A.-----	854
Enemas, nutrient, absorption and		( <i>Schizoneura</i> ) <i>lanigera</i> , notes,	
utilization.-----	258	Me.-----	161
Engines-----		<i>Erysiphe</i> -----	
antifreezing solutions for.-----	891	<i>graminis</i> , notes.-----	644, 845
gas, construction and operation.-----	487	<i>polygoni</i> , notes.-----	52
gas, gasoline, and oil, treatise.-----	287	Erythrocytes of Australian verte-	
gas, operation and efficiency.-----	891	brates.-----	577
gasoline, installing.-----	891	Escutcheon, relation to milk and	
internal combustion, adjusting		butter production, Ky.-----	670
traction and portable, uniform		Essential oils. (See Oils, essential.)	
boiler laws for.-----	588	Esters, volatile, determination in	
Enln, studies.-----	709	citrus oils and extracts.-----	410
Enological investigations, Cal.-----	207	ether extract of feeding stuffs.-----	13
Enteritis-----		ethyl acetate vapor, larvicidal value.	359
chronic. (See John's disease.)		Ethylene, effect on plant metabolism.	624
in sheep.-----	275		

# INDEX OF SUBJECTS.

951

Page.	Experiment—Continued.	Page.
<i>Eucactophagus graphipterus</i> , notes, N.J.-----	station work, coordination-----	2
<i>Eucallipterus flavus</i> , notes-----	stations as a field for research workers-----	701
<i>Eucalypts</i> , culture in Dominica-----	stations, functions of-----	699
<i>Eucalyptus</i> —	stations, organization lists, U.S.D.A-----	94
<i>n.spp.</i> , descriptions-----	stations, work and expenditures, U.S.D.A-----	493
<i>rudis</i> , culture experiments, U.S.D.A-----	(See also Alabama, etc.)	
<i>Eucalyptus</i> oil, larvicidal value-----	Extension work. (See Agricultural colleges and Agricultural extension work.)	
<i>Euceraphis gillettei n.sp.</i> , description-----	Extractives, value in nutrition-----	258
<i>Eudemis</i> moth—	<i>Fannia canicularis</i> , hibernation-----	254
destruction by heat-----	Farcy. (See Glanders.)	
notes-----	Farm—	
<i>Eudiagogus rosenchoeldi</i> , notes-----	animals. (See Live stock and Animals.)	
<i>Eumarschalia pennadui n.subg. and n.sp.</i> , notes-----	buildings, drawing and design-----	598
<i>Eumicrosoma denefica</i> , life history-----	buildings, plans-----	892
<i>Euonymus japonica</i> , respiration investigations-----	crops, feeding of, treatise-----	326
<i>Eupelminis suezei n.sp.</i> , description-----	equipment, calculating interest on, U.S.D.A-----	194
<i>Euproctis</i> —	laborers. (See Agricultural laborers.)	
<i>chrysorrhæa</i> . (See Brown-tail moth.)	leases in Iowa, Iowa-----	193, 792
<i>sp.</i> affecting tea-----	machinery. (See Agricultural machinery.)	
<i>Eurytoma junkiperinus n.sp.</i> , description-----	management in Chemung County, New York-----	791
<i>Eutettix</i> —	management in Chester County, Pennsylvania, U.S.D.A-----	592
<i>n.sp.</i> , description-----	management survey, Mo.-----	393
<i>tenella</i> . (See Beet leaf-hopper.)	management survey data, use, U.S.D.A-----	895
<i>Euthrips</i> —	mechanics school in Argentina-----	99
<i>occidentalis</i> , studies-----	products. (See Agricultural products.)	
<i>puri</i> . (See Pear thrips.)	structures, designs-----	487
<i>Eutypa</i> —	tenancy. (See Agricultural tenancy.)	
<i>coultrora</i> , notes-----	Farmers—	
<i>crumpens</i> , notes-----	attitude toward science-----	401
<i>Euzesta notata</i> , notes-----	elevators in Minnesota, Minn-----	392
<i>Euzoa ochrogaster</i> , poisoned bait for	institutes in Ontario-----	94
Evaporation—	National Congress of United States-----	596
from irrigation reservoirs and canals-----	small, in Italy-----	391
stations, installation and operation, U.S.D.A-----	value of education to, Mo-----	393
<i>Exetia</i> —	winter school for, Wash-----	494
<i>buoliana</i> in New Jersey-----	Farming—	
<i>buoliana</i> , notes-----	as a business, Wash-----	95
<i>resinella</i> , notes-----	in Canada-----	490
Evolution, mutation factor in-----	in United Kingdom in time of war-----	89
Excavating machinery, investigations, U.S.D.A-----	in Willamette Valley-----	490
Excitation in plants and animals-----	manual-----	635, 796
<i>Exenterus diprioni n.sp.</i> , description-----	safe, U.S.D.A-----	688
Exercise in education and medicine, treatise-----	systems-----	90
<i>Ezochonus quadripustulatus</i> , introduction into California-----	systems, production efficiency-----	298
<i>Ezoriata casar n.sp.</i> , description-----	tenant, in Yazoo-Mississippi Delta, U.S.D.A-----	593
Experiment—	(See also Agriculture.)	
Station at Yawngnaw, Burma-----		
station work as a basis for agricultural extension and demonstration-----		

Farms—	Page.	Feeding stuffs—Continued.	Page.
cost of fencing, U.S.D.A.-----	485	medicinal, inspection, Kans.-----	189
demonstration or illustration, in		pentosans of, Tex.-----	188
Canada-----	490	sugar-containing, notes-----	565
electricity on-----	87	valuation-----	379, 670
for sale in Connecticut-----	289	water-soluble nitrogen of-----	72, 501
planting-----	789	(See also specific kinds.)	
school, care and management-----	394	Feeds. (See Feeding stuffs.)	
sewage disposal on-----	88	Feeds and feeding, manual-----	261, 565
size of in Texas-----	488	Feldspar-----	
water power for-----	84, 185, 288, 586	as a source of potash-----	27, 323
Farmstead, arrangement and adorn-		deposits in Georgia-----	323
ment, N. Dak.-----	838	ground, as a fertilizer-----	323
Fasting, studies-----	863	Fence posts-----	
Fat-----		concrete, construction-----	487, 685
animal and plant, differentiation	13	preservation, Iowa-----	153, 743
animal, digestibility, U.S.D.A.---	364	Fences, construction-----	487
animal, effect of free fatty		Fencing, cost data, U.S.D.A.-----	485
acids on-----	312	Ferment action, studies-----	674
as a substitute for carbohy-		Fermentation-----	
drates for infants-----	462	alcoholic, monograph-----	318
determination-----	505	in wineries, Cal.-----	297
determination in cheese-----	206	Ferments-----	
determination in ice cream-----	113	carbohydrate, of pancreatic	
determination in milk-----	506	juice-----	257
determination in milk and		defensive, studies-----	578, 579
cream, U.S.D.A.-----	713	digestive, adaptation to diet-----	602
determination in milk and other		protective, formation-----	578
fluids-----	206	relation to digestion and other	
determination of quality in		life processes-----	563
cream-----	714	specific, for typhoid-coli group.	278
digestion and absorption-----	257	(See also Enzyms.)	
effect on protein metabolism-----	762, 763	Fern-----	
extraction, new apparatus for-----	818	caterpillar, Florida, notes, N.J.	158
extractor, description-----	804	prothallia, nutrition and devel-	
heat of bromination-----	803	opment of sexual organs in-----	824
metabolism, relation to blood		Fertilizer-----	
fat-----	563	experiments in Switzerland-----	22
technology and analysis, treatise.	507	experiments, systematic scheme	
Fatty acids. (See Acids.)		for-----	218
Feeding standards-----		(See also special crops.)	
agreement in-----	670	law in Pennsylvania-----	625
discrepancies in-----	379	plats, bacteriology of, Pa-----	127
for young cattle-----	372	requirements of soils. (See	
Feeding stuffs-----		Soils.)	
analyses-----	72, 371, 604, 767	situation in Germany-----	327
effect on milk and butter-----	570	situation in Great Britain-----	621
effect on milk fat globules-----	570	Fertilizers-----	
ether-soluble constituents of-----	13	analyses-----	332, 426, 625, 727
inspection and analyses, Ind-----	283	application-----	327
inspection and analyses, Kans-----	189	as nutrient for soil bacteria-----	327
inspection and analyses, N.H-----	188	bibliography-----	426
inspection and analyses, N.J-----	665	catalytic, use-----	623
inspection and analyses, Vt-----	371	effect on action of soil organic	
inspection in Florida-----	787	compounds, Tex-----	128
inspection in Georgia-----	586	effect on composition of meadow	
inspection in Maine, Me-----	371	hay-----	629
inspection in Maryland-----	566	effect on composition of med-	
inspection in Massachusetts,		icinal plants-----	18
Mass-----	467	effect on composition of soy	
inspection in North Carolina-----	263	beans, N.J-----	682
inspection in Ohio-----	371, 506	effect on crop growth-----	515
inspection in Pennsylvania-----	72	effect on development of cotton.	337
inspection in Texas, Tex-----	467	effect on pear blight-----	647
law in Kansas, Kans-----	169	effect on protein content of soy	
law in Texas, Tex-----	467	beans, N.J-----	140

Fertilizers—Continued.		Page.	Field experiments—		Page.
effect on soil fertility.....		517	accuracy in, U.S.D.A.....		827
fish, composition.....		28	correcting for soil differences, U.S.D.A.....		829
freight rates on.....		392	use of parallel plats in.....		634
handbook.....		29	Figs—		
home mixing.....		426	culture experiments, U.S.D.A....		231
inspection and analyses, Cal....		153	Smyrna, culture in California....		534
inspection and analyses, Conn. State.....		520	Filaria—		
inspection and analyses, Kans....		624	in horses, transmission by stable flies.....		359
inspection and analyses, Ky....	521, 822		in Philippines.....		879
inspection and analyses, Mass....		624	Filariasis, etiology.....		477
inspection and analyses, Me....		726	Filbert bacterial disease, notes....		351
inspection and analyses, N.H....		521	Filter, Berkefeld, usefulness.....		390
inspection and analyses, N.J....		625	Filters—		
inspection and analyses, N.Y. State.....		521	deep percolating, efficiency.....		888
inspection and analyses, R.I....		426	mechanical, tests.....		483
inspection and analyses, S.C....		521	Flr—		
inspection and analyses, Tex....		134	balsam, of Rocky Mountains, U.S.D.A.....		742
inspection and analyses, Vt....		332	Douglas, growth data.....		440
inspection and analyses, Wis....		134	Douglas, volume tables.....		641
inspection in Canada.....		625	waste, destructive distillation....		153
inspection in Louisiana.....		332	waste, use in tannin-extract in- dustry.....		508
inspection in Maryland.....		426	Fire blight in Wyoming.....		747
inspection in North Carolina....	426, 727		Fires, forest. ( <i>See</i> Forest fires.)		
inspection in Ohio.....		727	Fish—		
inspection in Pennsylvania.....		625	fertilizers, composition.....		28
international movement.....		426	guano, fertilizing value, Cal....		219
long-continued use, Pa.....		128	laws of Pennsylvania.....		650
mixing with seed.....		517	meal adulteration, detection.....		467
nature and use.....		326	meal, analyses.....		263
nitrogenous. ( <i>See</i> Nitrogenous fertilizers.)			meal, analyses, Mass.....		467
phosphatic. ( <i>See</i> Phosphates.)			poison, action of digestive fer- ments on.....		459
potash. ( <i>See</i> Potash.)			poisoning, studies.....		459
processed, nitrogen in.....		327	ponds, notes.....		569
purchasing in Netherlands.....		893	putrefaction of.....		163
residual effects.....		25	scrap, analyses, N.H.....		169
residual value, determination....		22	scrap, fertilizing value.....		28
utilization by crops.....		327	waste, analyses.....		28
yearbook.....		28	Flasks, suction, check value for....		608
( <i>See also specific materials.</i> )			Flax—		
Peteria—			cross-breeding experiments.....		629
chop, analyses, Tex.....		467	culture experiments, U.S. D.A.....	137, 228,	229
culture experiments, Wyo.....		630	culture for seed in Argentina....		434
use in bread making.....		67	culture in British East Africa....		35
Fiber—			culture under irrigation, Colo....		528
crops, culture experiments, Oreg.....		228	fertilizer experiments.....		330
crude. ( <i>See</i> Cellulose.)			straw, paper and fiber-board from U.S.D.A.....		509
industry in British East Africa....		227	succotash, analyses and feeding value.....		663
industry in Mauritius.....	227, 434		varieties, Wyo.....		630
plants, culture in German colonies.....		227	Flea beetles injurious to mustard...		65
Fibers—			Fleas—		
commercial valuation.....		227	notes, U.S.D.A.....		159
of Dutch East Indies.....		227	relation to plague-like disease of rodents.....		355
tropical, paper-making value....		227	Flies—		
Field—			as carriers of infection.....		254
crop competitions for boys and girls.....		493	control on college farm, N.J....		160
crops, cost of production, N.J....		187	destruction.....		856
crops, feeding of, treatise.....		326			
crops, water requirements, Nebr. ( <i>See also special crops.</i> )		228			
peas. ( <i>See</i> Peas.)					

Flies—Continued.	Page.	Food—	Page
destruction by bacterial cultures	264	analyses, N.Dak.	47
house. (See House fly.)		analysis, treatise	506, 610
hystricine, of Peru	65	bacteriological examination	713
hystricine, with white maggots	65	cereal. (See Cereal foods.)	
injurious to man	251	chemistry, progress in 1914	658
muscoid, notes	65	composition and cost in Spain	555
relation to myiasis in man and animals	359	composition and energy value	561
spallanzanine, of Andes	65	definitions and standards	661
white. (See White fly.)		effect on heat production in man	68
Floods of Nile	413	examination	762
Flora of Northwest Coast of United States, treatise	336	inspection in Connecticut, Conn. State	458
Floriculture, manual	836	inspection in Florida	792
Florida red scale, notes	60	inspection in Indiana	881
Flour—		inspection in Kentucky, Ky.	751
analyses	164, 760	inspection in North Carolina	961
baking strength	803	inspection in North Dakota, N. Dak.	67, 256, 386, 661
beetle, notes	754	poisoning epidemic, investigations	568
determination of strength and baking qualities	610	products, thickeners used in	167
feeding, analyses, N.J.	665	protection from contamination	790
fermentation losses in	660	recipes	794
from western Canada, baking qualities	365	review of investigations	762
low grade, analyses	72	stored, insects affecting	651
milling and baking tests, U.S.D.A.	558	supply of Germany	791
red dog, analyses	263, 371	supply of United Kingdom in time of war	80
red dog, analyses, Ind.	263	supply of United States Navy	167
red dog, analyses, Mass.	467	supply, relation to population	584
red dog, analyses, N.H.	168	use during war	561
red dog, analyses, VI.	371	vegetable, course in, U.S.D.A. (See also Diet.)	809
unbolted, detection in bread	113	Foot-and-mouth disease—	
Flower—		control	781
color, Mendelian factors for	335	in Germany	781
coloration, review of investigations	824	in Great Britain	582
pigments, review of literature	335	in Ireland	156
Flowers—		in man	383
color and structure in relation to sunlight	237	in United States	388
of sulphur, mixing with lime	51	outbreak in 1914, Mich.	777
peloria in	823	studies	273, 575, 677, 879
pressing	237	Forage—	
treatise	535	crop mixtures, tests, Wash.	739
variations in coloring matter	710	crops, culture, Wyo.	630
Fluorin, effect on vegetation	624	crops, culture experiments, Can.	34
Fodder—		crops, culture experiments, Oreg.	228
crops in India	262	crops, culture experiments, Wash.	736
inorganic, preparation	72	crops, fertilizer experiments	22
insects affecting	651	crops, field tests, accuracy in, U.S.D.A.	837
Fog—		crops for Colorado plains, Colo.	610
beach and fracto-cumulus, U.S. D.A.	118	crops for pigs, N.J.	172
in Manchester, England, U.S. D.A.	414	crops, improvement	34
Fomes—		crops in Union of South Africa	247
juniperinus in British East Africa	546	crops, laboratory manual	569
lucidus, notes	50	crops, varieties, Wash.	736
semitostus in tropical America	442	(See also special crops.)	
semitostus, notes	57, 744	moisture content and shrinkage, U.S.D.A.	837
		poisoning due to <i>Claviceps paspali</i> , Miss.	676
		poisoning in horses and mules	681

	Page.	Forests—Continued.	Page.
rest—		National, handbook for campers, U.S.D.A.	46
administration. (See Forestry.)		National, in United States, U.S.D.A.	46
assessment and survey in New South Wales	743	National, laws applicable to, U.S.D.A.	837
ecology, notes	441	National, telephone construction in, U.S.D.A.	191
fire legislation in United States	441	National, trail construction in, U.S.D.A.	190
fires in North Carolina	642	National, working plans	441
fires in Vermont	837	northern hardwood, U.S.D.A.	152
fires in Washington	837	of Alaska	640
fires, light burning as a protection against	441	of Anne Arundel County, Maryland	440
fires, protection against	238	of British Columbia	641
investigations in Dehra Dun	743	of Branger, Java	289
laws in North Carolina	642	of Smoky River Valley and Grande Prairie country, Canada	538
laws in Pennsylvania	152, 650	of United States	46
mapping, instruments for	641	planting in New York	152
preserve of New York	347	soil types for	640
products, foreign trade in, U.S.D.A.	194	utilization with portable mills	642
products of Canada	48, 348	windfall damage in	640
protection in California	638	Formaldehyde, effect on animal organism	460
protection, trend and practice	642	Formalin. (See Formaldehyde.)	
seeds. (See Tree seeds.)		Fossil ruminant from Rock Creek, Texas	264
succession, studies	537	Fowl brood law in Texas, Tex.	454, 657
survey in Sumatra	237	Fowl, putrefaction of	163
taxation in New Jersey	642	Fowls—	
tent-caterpillar, notes	752	fecundity in	370
trees. (See Trees.)		feeding experiments, Pa.	178
types, meteorological factors in working plans, history and development	640	killing loss in, Pa.	179
creation of school lands in Nebraska	347	relation to tuberculosis in pigs	277
creosote—		reproduction in	668
cooperation in	238	secondary sexual characters in	370
in Canada	238, 641	summer sickness of, N.J.	178
in Dutch East Indies	239, 143	White Leghorn, barring factor in, N.J.	177
in England	743	(See also Poultry.)	
in Europe, breeding and selection work in	536	Fox diseases, notes	784
in Hawaii	837	Foxes, silver, raising in eastern North America, U.S.D.A.	189
in India	46, 236, 441, 837, 838	Fracto-cumulus and beach fog, U.S.D.A.	118
in Japan	348	Frankliniopsis tenuicornis n.sp., description	62
in Java	348	Freezing—	
in Latin America	306	effect on composition of oranges and lemons	365
in New South Wales	838	germicide effect	382
in Nyasaland	743	Freight rates on agricultural products	392
in Philippines	306	Frit fly—	
in Prussia	348	attacking corn	454
in Quebec	239	injurious to summer-sown crops	360, 449
in Queensland	239	Frogs as affected by low temperature	751
in Russia, steppe region	538	Frontina spectabilis n.sp., description	855
in Saxony	743		
in South Australia	743		
in United States	46, 152		
in Vermont	837		
instruction in United States	308		
yearbook	404		
crusts—			
as affected by light burning	441		
brush disposal in	441		
effect on temperature of air current, U.S.D.A.	413		
insects affecting	251		

Frost—	Page.	Fruit—Continued.	Page.
in United States, bibliography, U.S.D.A.	414	tree gummosis, notes	846
protection against	319, 341, 509	tree leaf-roller, pupal instar	357
relation to temperature inver-		tree leaf-roller, remedies	63, 502
sions	715	tree, leaf-roller, remedies, N.Y.	
$\alpha$ -D-Fructose pentacetate, notes	408	Cornell	755
Fruit—		tree leaves, insects affecting	549
at Agronomic Experiment Sta-		tree wounds, asphaltum as a	
tion, Santiago de las Vegas,		dressing for, Pa.	154
Cuba	437	trees as affected by dynamiting,	
anctions in New York	490	Pa.	125
bud sports in	740	trees, top-grafting	457
by-products, manufacture, Cal.	207	trees, wood decay in, Cal.	55
canning	714	tropical and semitropical,	
citrus. (See Citrus fruits.)		manual	428
culture experiments, S.C.	635	tropical, culture in Philippines	625
culture experiments, U.S.D.A.	231	varieties, S.C.	635
culture in Lucknow	232	varieties, U.S.D.A.	231
culture in South Carolina	233	varieties for British Columbia	457
culture, relation to low tem-		varieties for Georgia	475
perature	737	varieties for Illinois	475
culture, relation to tempera-		varieties for New Jersey, N.J.	144
ture variations, Utah	613	varieties for West Virginia	627
culture, treatise	533	varieties for western Washing-	
dried, microbiology	460	tion, Wash.	796
fertilizers for	436	Fuel, saving in house heating	758
flies in Brazil	858	Fulgoroidea, hymenopterous parasites	557
fly, Mediterranean, as affected		<i>Fumago citri</i> , notes	445
by cold storage, U.S.D.A.	554	Fumigating room, gas-tight door for,	
fly, Mediterranean, control	360	Cal.	66
fly, Mediterranean, control in		Fumigation—	
Hawaii	758	leakage meter, calibration, Cal.	751
fly, Mediterranean, dissemina-		of households, Ark.	663
tion by bananas, U.S.D.A.	655	Fungi—	
fly, Mediterranean, notes	856	as affected by aluminum	536
fly parasites in Hawaii	59, 556	as affected by cold, U.S.D.A.	538
new, at Minnesota Fruit Breed-		biological studies	49
ing Farm	637	cellulose destroying	138
new or noteworthy in Philip-		isolating single-spore strains	32
plines	639	polymorphism in	32
orchard, acclimatization, U.S.		wood-decaying, treatment, Cal.	249
D.A.	231	wood-destroying, in orchard	
orchard, blooming dates, N.J.	144	trees, Cal.	55
orchard, bridge grafting, U.S.		Fungicides—	
D.A.	833	analyses, Mich.	426
orchard, culture experiments	833	analyses, N.J.	426
orchard, culture in South Aus-		inspection, Me.	49
tralia	341	preparation and use	645
orchard, fertilizer experiments	833	preparation and use, Colo.	528
orchard, insects affecting	251, 651	preparation and use, Mich.	428
orchard, varieties, U.S.D.A.	231	preparation and use, N.Y.	739
parthenocarpy in	226	Cornell	739
picking and handling	437	standard v. nonstandard, Cal.	267
pollination	233, 341	Fur—	
propagation	533	bearing animals, laws relating	741
pruning	533, 833	to, U.S.D.A.	570
self-sterility in	341	buyers' guide	
small, acclimatization, U.S.D.A.	231	<i>Furcraea gigantea</i> , varieties grown in	
small, culture in British Colum-		Mauritius	454
bia	438	Furniture, insects affecting	651
small, insects affecting	651	Fusarium—	
small, varieties, U.S.D.A.	231	<i>conglutinans</i> , studies, Wis.	547
stone, bacterial disease of,		<i>erubescens</i> on tomatoes	57
N.Y.Cornell	248	<i>eumartii</i> n.sp., description,	
tree borers, notes, Mo.Fruit	361	U.S.D.A.	246

<i>Fusarium</i> —Continued.	Page.		Page.
<i>lycopersici</i> , tomatoes resistant to.....	646	<i>Gelechia gossypiella</i> , notes.....	227
<i>niveum</i> on watermelon, N.C.....	53	Genetics, modes of research in, treatise.....	563
sp. as affected by cold, U.S.D.A.....	538	<i>Geniocerus</i> spp., notes.....	450
sp. on bananas.....	841	Geography, manual.....	599
sp. on raspberry roots.....	55	Geometridæ, nomenclature.....	651
sp. on sesame.....	50	<i>Geomyces</i> n.g. and n.spp., descriptions.....	226
sp. on potatoes, U.S.D.A.....	246	Georgia—	
sp. on sweet potatoes, Del.....	156	College, notes.....	600
<i>Fusarium</i> , pathological species.....	840	Station, notes.....	295, 300
Fusel oil, insecticidal and larvicidal value.....	359	Germ plasm—	
<i>Fusicladium</i> —		as a stereochemic system.....	111
<i>dendriticum</i> . (See Apple scab.)		experimental modification.....	33
<i>pinum</i> , notes.....	846	Ginseng—	
<i>Gehrardella</i> —		diseases, notes, Mich.....	244
<i>caricollis</i> , life history, U.S.D.A.....	756	phytophthora disease, studies, N.Y.Cornell.....	746
<i>deceus</i> , notes, Me.....	853	root rot, studies, U.S.D.A.....	245
<i>lateola</i> , notes.....	752	Sclerotinia affecting, U.S.D.A.....	350
Gall midges of New York.....	752	Gipsy moth—	
Galls, insect—		notes.....	752
formation.....	557	parasites of.....	652
of Java.....	549	Girls—	
lime—		club work in Massachusetts.....	394
as a reservoir of human trypanosomiasis.....	187	club work in Nevada.....	899
laws for 1915, U.S.D.A.....	157	clubs, organizing.....	793
laws of Pennsylvania.....	650	country, life of.....	290
putrefaction of.....	163	field-crop competitions.....	493
indul as a cover crop, P.R.....	736	Gladioli, evolution.....	237
ingene, gaseous, treatment.....	383	Glanders—	
inrage—		control in Hawaii.....	477
disposal, Wash.....	790	control in New York.....	782
household, feeding stuffs from.....	466	diagnosis.....	81
siftings, analyses, Conn.State.....	521	185, 276, 576, 677, 781, 782	
tankage, fertilizing value, Cal.....	219	extermination.....	677
arden plants, rew, at Kew.....	40	in Connecticut.....	274
ardening—		in Great Britain.....	382
manual.....	30, 635, 836	papers on.....	576
market, in New York.....	40	prophylaxis.....	782
ornamental, bibliography.....	238	Gladii—	
ornamental, treatise.....	238, 345, 535	proteoses, physiological action.....	71
vegetable, treatise.....	340, 345, 833	separation from nongladiin proteins.....	610
ardens—		<i>Glucosporium</i> —	
home, suggestions for.....	635	<i>alborubrum</i> , notes.....	540
mountain, treatise.....	45	<i>caulivorum</i> on red clover, Pa.....	155
school. (See School gardens.)		<i>fructigenum</i> , notes.....	247
arlic, wild, destruction, Ind.....	738	<i>lagenarium</i> , notes.....	843
as, illuminating, effect on roots.....	243	<i>lunatum</i> , notes.....	543
as-phlegmon, specific, in hogs.....	479	<i>manifera</i> , notes.....	442
aseous—		<i>manihotis</i> , notes.....	843
exchange, determination in man.....	260	sp. on apples.....	644
metabolism of gymnasts.....	261	sp. on bananas.....	841
ases, dissolved, determination in waters and effluents.....	410	sp. on cassava.....	841
asoline, insecticidal value, Mich.....	252	sp. on coconuts.....	242
astric—		sp. on tomatoes.....	841
julee, secretion in man.....	463	spp. as affected by temperature.....	541
residuum, properties of.....	663	<i>Glucosporium</i> and <i>Colletotrichum</i> on chili, identity.....	50
astictis, parasitic in sheep.....	275	Glomerella as affected by temperature.....	541
astro-intestinal studies.....	659, 862	<i>Glomerella</i> —	
esse, ancestry.....	569	<i>cingulata</i> , notes.....	247
elatin—		<i>cingulata</i> , utilization of pentoses by.....	351
roller waste, analyses, Conn.State.....	521		
use in food products.....	167		

	Page.		Page.
<i>Glomerella</i> —Continued.		Gophers, pocket—	
<i>rufomaculans</i> as affected by		notes	651
cold, U.S.D.A.	538	revision, U.S.D.A.	446
<i>rufomaculans</i> , notes	646	Gossypol, studies, U.S.D.A.	381
Glucosamin hydrochlorid, prepara-		Grafting, bridge, notes, U.S.D.A.	836
tion	803	Grain—	
Glucose—		and grain products, exports,	
formation from human pro-		U.S.D.A.	194
teins	366	aphis, spring, remedies, U.S.D.A.	616
syrup, analyses	660	beetles, saw-toothed, notes	754
Glue factory refuse, analyses, Conn.		binders, tractor, operation	851
State	521	driers, tests	44
Gluten—		elevator accounting, U.S.D.A.	896
feed, analyses	566	elevators, concrete, design	636
feed, analyses, Mass.	467	elevators in Minnesota, Minn.	382
feed, analyses, N.H.	169	farming in corn belt, U.S.D.A.	791
feed, analyses, N.J.	665	freight rates on	392
feed, analyses, Vt.	371	germinated, determination of	
meal, fertilizing value	520	proteolytic strength	315
wheat, colloidal swelling	111	mixed, v. cotton-seed cake for	
Glycerin		cattle, Ariz.	176
determination in wine	506	mixture for cows, Pa.	191
effect on alcoholic determina-		prices and shrinkage, Ill.	535
tion of beverages, N.Dak.	661	proteins of, differentiation	577
germicidal power	876	screenings, composition and use	693
Glycin, effect on action of alcohol		small, culture for hay and pas-	
on plant cells	333	ture, Colo.	630
Glycocoll, effect on plant growth	31	smut, inoculation on Guinea	
<i>Gnamptodon nepticula</i> n.sp., de-		corn	644
scription	456	sprouted, as a poultry food,	
<i>Gnomonia</i> —		Wash.	294
<i>rubi</i> , notes	55	stored, insects affecting	549, 754
<i>veneta</i> , notes	56	winter, culture, S.Dak.	259
Goat—		yield in relation to meteorology.	208
diseases, nature and treat-		(See also Cereals and special	
ment	383	crops.)	
manure, fertilizing value, Cal.	219	Gram, acid secretion of	525
Goats—		Grape—	
ancestry	372	berry moths, treatise	556
Angora, care and management	380	black rot, description	565
breeding and management in		bug, banded, notes	752
Germany	265	chlorosis, notes	221, 749
care and management	270	chlorosis, treatment	544
milk, care and management	380	culture, relation to meteorology	254
milk, records	270	diseases, hot water treatment	50, 545
milk, records, Cal.	270	diseases, studies	416
<i>Godetia gracilis</i> n.sp., description	336	diseases, treatment	74
Gonadectomy, effect on growth of		downy mildew, studies	352, 545, 544
rats	263	downy mildew, treatment	544, 748, 846
<i>Gonatocerus ovicentatus</i> n.sp., notes	657	gray rot, notes	847
<i>Gongylonema scutatum</i> —		juice, changes in	41
in Argentina	478	leaf-hopper, notes, N.J.	158
life history	783	leaves, spray injury	853
<i>Goniomyia unifasciata</i> , parasitic on		mildew, notes	719
army worm	251	mildew, treatment	841, 842
Goose fat, digestion and absorption	257	Oidium or powdery mildew,	
Gooseberries, varieties resistant to		notes, Cal.	544
mildew	834	Oidium, relation to weather	546
Gooseberry—		phylloxera, remedies	248
mildew, notes	649	powdery mildew, hibernation	847
mildew, studies	241	root worm, notes, N.Y.State	65
mildew, treatment	352	seed, wild, oil of	501
747, 834, 843, 846		Grapefruit. (See Pomeios.)	
root rot, notes	49		

	Page.	Grasshoppers—Continued.	Page.
Grapes—		notes	752
Bordeaux injury to	748	outbreak in New Mexico, U.S.	
coloring matter of	709	D.A.	159
culture experiments	221	(See also Locusts.)	
culture in France	234	Gravels of New Hampshire and Ver-	
culture in Italy	235	mont	787
culture in South Australia	341	Gravitation and related phenomena	494
culture in South Carolina	233	Grazing—	
determining affinity of stock		lands of Scotland	209
and scion	42	on public lands	305
direct bearers in France	234, 344	Green—	
French-American and American		bug. (See Grain aphid, spring.)	
hybrids	884	fruit worm, notes	752
green, in ripe bunches	234	manure as nutrient for soil bac-	
improvement in Minnesota	637	teria	327
inheritance in, N.Y.State	234	manure crops of Java	344
liming experiments	221	manure, decomposition as af-	
Muscadine, notes, U.S.D.A.	884	ected by manure, N.J.	129
pruning, Iowa	234	manure for arid soils	621
ripening studies	43	manuring, notes, Mass.	138
Rotundifolia, propagation, S.C.	635	oil, insecticidal value	359
Vitifera, winter treatment, N.		Greenheart, durability tests	56
Met	737	Greenhouses—	
Grapevine—		heating by hot water	88
moths, biology and remedies	654	insect pests of, Ohio	59
sap, composition, U.S.D.A.	428	Gregarine parasites, new, descrip-	
Gregarines—		tion	364
analyses	767	Gregarines, chromosome cycle	458
resistance to hot water	843	<i>Grindelia orepana wilkesiana</i> n.sp.,	
Trupholitha—		description	336
zechistaceana, notes	656, 758	Grit, value in poultry feeding	377
spp. injurious to fir and spruce	855	Grocery stores, inspection in In-	
Grass—		diana	861
culture, Wyo.	630	Ground levels in democracy, book	796
culture experiments, Can.	31	Groundnuts. (See Peanuts.)	
culture experiments, Oreg.	228	Growth—	
culture experiments, Wash.	736	as affected by pituitary feeding	765
culture in north Wales	323	diet essentials for	368
diseases, treatment	541	resumption after stunting	562, 862
effect on milk and butter	570	studies	561
fertilizer experiments	25, 423	<i>Gryllotalpa</i> —	
fertilizer experiments, Pa.	128	<i>gryllotalpa</i> in New Jersey	653
fresh, composition and digesti-		<i>culgaris</i> , notes	61
bility	371	Guanidin nitrate, fertilizing value	25
hybridization experiments, Oreg.	228	Guinea pigs—	
improvement	34	genetic studies	464
insects affecting	851	immunization with tubercle	
land, basic slag for	298	bacilli	82
liming experiments, Pa.	132	Gullet worm of sheep and cattle,	
new or not-worthy, in U. S. Na-		life history	783
tional Herbarium	226	Gulls, North American, distribution	
palatability, Ohio	865	and migration, U.S.D.A.	158
pasture, culture experiments,		Gum—	
U.S.D.A.	228	arabic, use in food products	167
rusts, studies, Ind.	744	desert, culture experiments,	
seedlings, comparative anatomy	134	U.S.D.A.	232
sickness in lambs	383	tragacanth, use in food prod-	
varieties, Wash.	736	ucts	167
webworms, notes	752	Gymnasts, gaseous metabolism of	261
(See also specific kinds.)		<i>Gymnoporangium</i> —	
Grasshoppers—		<i>juniperi-virginiana</i> , studies, Va.	54
and their control, U.S.D.A.	158	<i>koreanae</i> , studies, U.S.D.A.	840
control in Imperial Valley, Cal.	450	<i>macropus</i> , studies, Pa.	157
control in New York	61	spp. on apples, Wis.	444
destruction	653	<i>tubulatum</i> on junipers	546
in Colorado	651		

	Page.	Heat—Continued.	Page.
Gymnosporangium, new Asiatic, in Oregon.....	362	insecticidal value, Mich.....	253
Gypsum—		relation to summer diarrhea of infants.....	492
decomposition in soils.....	217	solar, seasonal variations in.....	415
effect on protein content of soy beans, N.J.....	141	use against insects.....	50, 653
effect on soil micro-organisms, U.S.D.A.....	625	(See also Temperature.)	
fertilizing value.....	725	Heifers—	
fertilizing value, Pa.....	133	care and management, Ohio.....	471
industry in United States.....	221	cost of raising, Mass.....	671
Habichuela—		cost of raising, Ohio.....	479
climarrona, culture, P.R.....	736	Helophila—	
parada, culture, P.R.....	736	spp. in southern Texas.....	453
Hamatobia serrata. (See Horn-fly.)		unipuncta. (See Army worm.)	
Hamogammas sanguineus n.sp., description.....	66	Heliothrips sp. affecting tea.....	552
Hamoproteus columbae, sporogony.....	855	Heliotropism as affected by salts.....	333
Hall—		Helminthosporium—	
formation, theories.....	208	sacchari, notes.....	49
in Maryland, U.S.D.A.....	413	sp. on corn.....	541
protection, electric niagaras.....	208	turcicum, studies.....	514
Halogens, determination in organic compounds.....	806	Hemerobius pacificus, notes.....	527
Halos—		Hemileia vastatrix—	
notes, U.S.D.A.....	614	notes.....	540, 744, 54
observations, U.S.D.A.....	413	treatment.....	545
relation to weather.....	207	Hemiptera in Florida.....	559
Hardwood—		Hemispherical scale, notes.....	622
distillation, temperature control in.....	48	Hemlock seedlings, root rot of.....	546
forests, northern, U.S.D.A.....	152	Hemorrhagic septicemia. (See Septicemia.)	
Harlequin cabbage bug, notes, Tex.....	451	Hemp—	
Hartigiella laticis, notes.....	849	culture experiments, U.S.D.A.....	259
Hatch, W. H., memorial to.....	8	Queensland, culture in the South.....	35
Haustoria, purpose of.....	627	seed cake, effect on milk and butter.....	471
Hawaii Federal Station, notes.....	495	seed for chicks, Ky.....	571
Hawthorn sawfly leaf miner—		Hen—	
studies, N.Y.State.....	657	crowing.....	25
studies, U.S.D.A.....	456	manure, use, Ohio.....	494
Hay—		Hendersonia—	
as human food.....	256	rubri, notes.....	55, 241
cured in various ways, digestibility.....	371	sacchari, notes.....	48
effect on milk and butter.....	570	Hens—	
fall-sown, Wash.....	95	artificial light for, Wash.....	658, 770
fertilizer experiments.....	22	feeding experiments, Cal.....	26
fertilizer experiments, Mass.....	294	feeding experiments, N.J.....	177
fertilizer experiments, Pa.....	131	feeding experiments, Pa.....	175, 179
flour, analyses.....	164	individual characteristics, Pa.....	175
grades of.....	528	range v. confinement for.....	699
mixed, cost of production, N.J.....	137	winter egg production in, U.S.D.A.....	479
native, analyses, Wyo.....	467	Herbs, phloem and bark diseases of.....	442
(See also Alfalfa, Clover, Timothy, etc.)		Heredity—	
"Head grit" in lambs.....	383	and mutation as cell phenomena.....	825
Health certificates, interstate recognition of.....	185	bibliography.....	37
Heat—		chromosome theory.....	255
effect on cane sugar dissolved in milk.....	164	in beans, velvet-Lyon, U.S.D.A.....	453
effect on nutritive value of milk and its products.....	368	in corn, Conn.State.....	14
effect on soils.....	722	in corn and pepper, N.J.....	22
		in cotton.....	177
		in fowls, N.J.....	149
		in garden plants, N.J.....	251
		in grapes, N.Y.State.....	451
		in guinea pigs.....	182
		in Onothera.....	

Heredity—Continued.	Page.	Hog cholera—	Page.
in <i>Oxalis</i> .....	823	auto-infection in.....	279
in plants, studies.....	822	cell inclusions in.....	679
in rabbits.....	370, 466, 864	complement fixation in.....	582
in sheep.....	864	control in Germany.....	185
in tomatoes.....	42	control in Iowa.....	387
in tomatoes, N.J.....	146	control in Minnesota.....	188
in wheat.....	531	control in Tennessee.....	777
in white mice.....	370	control in United States. 185, 273, 280	
of alterations in corn.....	31	cures and specifics, so-called,	
of color in rabbits.....	370	Iowa.....	82
of defects in horses.....	576	diagnosis, Mich.....	777
of doubleness in <i>Matthiola</i> and		dissemination.....	275
<i>Petunia</i> .....	237	filterable organism in.....	680
of egg production in hens.....	74	immunization.....	184, 575
of fertility in swine.....	490	in Germany.....	575
of flower size in <i>Nicotiana</i> .....	225	in Great Britain.....	382
of habit in beans.....	41	in Imperial Valley, Cal.....	274
of heterostylism in <i>Primula</i>		notes.....	188
<i>acaulis</i> .....	226	prevention, Ky.....	680
of milk production.....	671	relation to parasites.....	280
of sex.....	564	remedies, tests, Ind.....	783
of spotting in mice.....	466	review of investigations.....	386
of triplet births in cattle and		secondary invaders.....	479
sheep.....	767	serum as affected by heat, Ind.....	783
of twinning in sheep, U.S.D.A.....	73	serum immune bodies of, Mich.....	777
of wool production in sheep.....	74	serum production.....	185, 273
relation to mitochondria.....	629	serum production, virulent salt	
role of cross-fertilization and		solution in.....	680
self-fertilization in.....	629	serum, refinement.....	387
<i>Eringia dodeceola</i> , notes.....	855	serum, separation of antibody	
<i>Eritrera minor</i> , notes.....	240	fractions.....	479
<i>Eriopichia nigra</i> , notes.....	56	serum, standardization.....	280
Hessian fly, studies.....	250	serum, vacuum method of draw-	
<i>Heteracordylus malinus</i> —		ing.....	386
oriposition.....	255	studies.....	82
studies, N.Y.Cornell.....	754	virus, action of Kreso on.....	583
<i>Heterodera</i> —		virus, fixed.....	184
<i>radicicola</i> , new hosts of.....	349	Hogs. (See Pigs.)	
<i>radicicola</i> , notes.....	841	<i>Holanusomyia pulchripennis</i> n.g. and	
<i>radicicola</i> on coffee.....	55	n.sp., description.....	857
<i>schachtlii</i> in California.....	453	<i>Homalomma pteronidea</i> n.sp., de-	
<i>Heterosporium gracile</i> , studies.....	354	scription.....	456
<i>Hevea brasiliensis</i> . (See Rubber,		Home economics—	
Para.)		extension work in New Jersey,	
<i>Hibiscus oculiroseus</i> , dwarf sport....	335	N.J.....	197
<i>Hibiscus</i> , ornamental, breeding ex-		instruction, cultural value.....	897
periments, N.J.....	146	instruction in elementary	
Hickory.....		schools.....	395
lark beetle, notes, N.J.....	158	instruction in France.....	899
top-working with pecans, Ga.....	151	instruction in high schools.....	395
Hides, disinfection.....	781	instruction in Indiana.....	395
Highway—		instruction in New Mexico.....	793
bridges and structures, paper		instruction in Ontario.....	897
on.....	484	text-book.....	233, 395, 599, 794
engineering, treatise.....	586	Home—	
statistics and data, uniformity.....	484	furnishing and decoration, out-	
work, equipment for.....	484	line.....	293
(See Roads.)		grounds, arrangement, N.Y.Cor-	
Hilgard, E. W., biographical sketch....	301	nell.....	741
Hinck wood, essential oil of.....	802	grounds, laying out.....	238
<i>Hippodamia convergens</i> , life history		science. (See Home economics.)	
and habits, Va.Truck.....	555	Hominy—	
		feed, analyses.....	72, 371, 566
		feed, analyses, Ind.....	283
		feed, analyses, Kans.....	169

Hominy--Continued.	Page.	Horticulture, summer practice	Page
feed, analyses, N.J.	665	course in	292
feed, analyses, Tex.	467	Hotbeds--	
feed, analyses, Vt.	371	construction, Wash.	494
hulling corn for	66	construction and management,	49
meal, analyses	566	N.Y.State	
meal, analyses, Ind.	263	construction and management,	
meal, analyses, Mass.	467	Wash.	767
meal, analyses, N.H.	169	Hotels, inspection in Indiana	561
meal, analyses, N.J.	665	Hottest region in United States,	
Honey, imports and exports, U.S.D.A.	454	U.S.D.A.	114
Honeybees. (See Bees.)		House fly--	
<i>Hoplandrothrips affinis</i> n.sp., notes	255	hibernation	554
<i>Hoplothrips corticis</i> , notes	560	mannal	870
Hops--		preoviposition period, U.S.D.A.	674
Insects affecting	651	relation to plague-like disease	
resins of	502, 711	of rodents	363
spent, as a feeding stuff	263	Household--	
<i>Horistonotus whlerii</i> , habits and		accounting, course in	94
anatomy	566	budgets, blanks for	257
Horn fly--		conveniences, notes	750
notes	753	exhibits at fairs	94
parasites in Hawaii	59	management, teaching	92
Hornbill, giant, peculiarity in growth		wastes, disposal, treatise	766
of tail feathers	850	Housekeeping conditions among	
Hornet, European, notes	752	"Pennsylvania Germans"	577
Horse--		Houses, heating	749
Carnot, notes	869	Humic--	
chestnut leaf diseases, treat-		acid, behavior toward anions	324
ment, N.Y.Cornell	747	bodies, formation from organic	
diseases, nature and treatment	383	substances	515
diseases, treatise	278, 477, 794	<i>Humicola</i> n.g. and n.spp., descrip-	
labor, cost of	568	tions	224
meat, detection in canned beef	113	Humidity--	
scab, notes	576	atmospheric, measurement	495
Horse-radish, culture, Wash.	95	effect on human body	464
Horses--		relation to greenhouse culture	
as affected by smoke from lead		of roses, N.J.	44
works	278	Humic substances, treatise	768
breeding and training, treatise	869	Humus--	
breeding in South Africa	268	determination in soils	496
care and management, treatise	268	formation from sugar	513
changes in form due to fatten-		formation from vegetable com-	
ing, Pa.	174	pounds	518, 619
dissection, guide	450	formation in soils	611
dissection of cranial nerves and		in California soils	624
blood vessels	188	of arid soils, nitrogen content,	
feeding experiments	769, 869	U.S.D.A.	718
feeding experiments, Ohio	865	of loess soils of Nebraska	898
feeding experiments, Pa.	175	silicate, fertilizing value	19
gestation period, determination	565	Hurricane--	
inheritance of defects in	576	Pacific, of September, 1915,	
inspection and disinfection for		U.S.D.A.	411
interstate shipment	185	tropical, in Louisiana, U.S.D.A.	411
race, treatise	869	Hurricanes--	
treatise	668, 794	effect on upper air current,	
Horticultural--		U.S.D.A.	418
experimental work in Denmark	696	in Jamaica, U.S.D.A.	613
Gardens at Lucknow, report	232	<i>Hyalomma aegyptium</i> , relation to	
instruction in Ontario	196	Mediterranean coast fever	384
opportunities for educated		Hydraulic rams, construction and	
women	492	operation	483
		<i>Hydriomena</i> spp. in Vancouver	
		Island	657

# INDEX OF SUBJECTS.

963

	Page.	Idaho—	Page.
<b>Hydrocyanic acid—</b>			
determination.....	11	Station, notes.....	797
gas, fumigation with, Ark.....	653	Station, report.....	795
gas, generation by portable machines, Cal.....	191	University, notes.....	495
gas, insecticidal value, Mich.....	252	<b>Idiocerus—</b>	
gas, use against household insects, U.S.D.A.....	854	<i>pemmistulans</i> n.sp., description.....	587
in <i>Ornithopus</i> spp.....	525	<i>maculipennis</i> , notes.....	752
Hydro-electric development in California.....	682	<i>provancheri</i> , biology.....	461
<b>Hydrogen—</b>		Illinois University and Station, notes.....	96, 797
electrode, description.....	712, 804	Immunity, studies.....	674
peroxid, detection in milk.....	507	Immunology, treatise.....	275
Hydrotropism in lupine roots.....	223	<b>Inbreeding—</b>	
Hydroxymethylfurfuraldehyde, production from carbohydrates.....	11	measurement, Me.....	564
Hygiene and sanitation, military, text-book.....	369	variations under.....	564
Hygrometer, chemical, description.....	208	Incubators, temperature for, Cal.....	268
<i>Hylotropis juniperi</i> n.sp., description.....	254	India rubber. (See Rubber.)	
<i>Hymenochete noxia</i> , notes.....	442, 540, 744, 849	Indiana Station, report.....	795
<b>Hymenoptera—</b>		Indican—	
parasitic, habits.....	363	detection in urine.....	808
crespid and sphecoid, in Guatemala.....	857	urinary, elimination during fasting.....	863
<i>Hypericum perforatum</i> , chemistry and anatomy of.....	522	Indigo, culture in Bihar.....	35, 36
Hypochlorite, applying automatically to sewage.....	390	Industrial education—	
Hypochlorous acid, antiseptic action.....	675	in high schools of Minnesota.....	195
<i>Hypochoeris solani</i> and <i>Rhizoctonia solani</i> , identity.....	443	in New Mexico.....	793
Hypocotyl, elongation, N.J.....	134	<b>Infant—</b>	
<i>Hypoderma lineatum</i> and <i>H. bovis</i> , biology.....	881	feeding and metabolism, treatise.....	460
<i>Hypogages rubi</i> , studies.....	352	metabolism and nutrition, studies.....	461
<i>Hypomomema malinellus</i> , remedies.....	355	<b>Infants—</b>	
<b>Hypostema—</b>		and adults, digestion in.....	167
sp. parasitic on sugar cane borer.....	753	diet and care.....	561
torricella, notes.....	556	feeding.....	258, 662
Hypometric map of Russia, U.S.D.A.....	118	metabolism experiments.....	462
<b>Ice—</b>		newborn, physiology of.....	861
cream and ices, manufacture, treatise.....	860	protein requirement.....	68
cream, bacteriology, U.S.D.A.....	165	raw milk for.....	659
cream, manufacture, Wis.....	859	soy bean gruel for.....	859
cream, relation to typhoid fever epidemics.....	236	stomachs, acidity of.....	167
for the farm.....	892	summer diarrhea in relation to heat.....	462
houses, construction.....	892	<b>Influenza, equine—</b>	
costs purchased. (See Cottony cushion-scale.)		pectoral form.....	681
<b>cheimom flies, North American, revision.....</b>	454	prevention.....	184
<i>cheimom letus</i> , <i>I. canadensis</i> , and <i>I. fasciatus</i> , identity.....	657	<b>Infra-red rays—</b>	
<i>cheimomida</i> .....		absorption by soils.....	817
of Great Britain, treatise.....	657	absorption by soils, U.S.D.A.....	414
physiology, studies.....	758	<b>Inheritance. (See Heredity.)</b>	
leth, studies.....	709	<b>Insect—</b>	
		parasites. Introduction into Hawaii.....	548
		parasites, studies.....	751
		trap for refuse box, Cal.....	60
		traps, illuminated, tests.....	851
		<b>Insecticides—</b>	
		analyses, Mich.....	436
		analyses, N.J.....	639
		contact, mode of action, Mich.....	252
		inspection, Me.....	40
		notes.....	449
		preparation and use.....	643, 651
		preparation and use, Colo.....	539, 548
		preparation and use, Mich.....	436

<i>Insecticides—Continued.</i>		Page.	<i>Insects—Continued.</i>	
<i>preparation and use, N.Y. Cor-</i>			<i>Injurious—continued.</i>	
nell.....	739		to orchard fruits.....	501
standard v. nonstandard, Cal.....	232		to raisins, Cal.....	60
tests, U.S.D.A.....	60		to shade trees in Quebec.....	250
<i>(See also specific forms.)</i>			to stored grain.....	724
<i>Insects—</i>			to Sudan grass.....	446
as carriers of chestnut blight			to sugar cane.....	539, 733
fungus.....	853		to sunflowers.....	456
carotinoids in.....	865		to tea.....	835
defense against parasites.....	751		to truck crops.....	851
destruction by contact insecti-			to wheat.....	851
cides, Mich.....	252		of Atlin district, British Colum-	
destruction by dynamite, Pa.....	125		bia.....	651
destruction by heat.....	653		of South India, treatise.....	549
destruction by hot water.....	50		poisoned bran mash for.....	61
destruction by moles.....	58		relation to beet blight.....	559
endoparasites of, Wash.....	753		relation to blight in fruit.....	648
exotic, protection against.....	851		relation to chestnut blight.....	448
flying, diseases transmitted by.....	570		relation to sugar beet curly top.....	646
household, remedies, U.S.D.A.....	854		relation to sugar beet curly top,	
importation into New Jersey.....	355		Cal.....	241
<i>Injurious—</i>			resistance to hot water.....	813
in Barbados.....	753		scale. ( <i>See</i> Scale Insects.)	
in Belgian Kougo.....	851		sucking, effect on potato foliage.....	449
in Bihar and Orissa.....	250		transmission of verruga by.....	353
in Ceylon.....	652		wood-boring, remedies.....	652
in Colorado.....	651		<i>(See also specific insects.)</i>	
in Dutch East Indies.....	744		<i>International—</i>	
in greenhouses, Ohio.....	59		Association of Dairy and Milk	
in Hawaii.....	59		Inspectors.....	473
in India.....	543		catalogue of chemistry.....	407
in Jamaica.....	349		catalogue of physiology.....	855
in Mauritius.....	754		Congress of Tropical Agricul-	
in New Jersey, N.J.....	158		ture.....	227
in New South Wales.....	652		Road Congress.....	287
in New York.....	752		Veterinary Congress.....	875
in Nyasaland Protectorate.....	549		Interpolation as a means of approxi-	
in Porto Rico.....	752		mation.....	798
in Quebec.....	250, 449		<i>Intestinal—</i>	
in St. Lucia.....	651		autointoxication, relation to	
in St. Vincent.....	651		amins of organ extracts and	
in Salgir.....	652		body fluids.....	718
in Scotland.....	652		putrefaction as affected by wa-	
in Southern Nigeria.....	851		ter drinking.....	763
in Uganda.....	549		Inulin metabolism by plants.....	427
in Wye.....	651		<i>Invertase—</i>	
manual.....	651		activity, influence of certain	
notes, Colo.....	548		substances on.....	803
remedies.....	249, 548, 748		as affected by sodium chloride.....	408
remedies, N.Y. Cornell.....	40		distribution in beets.....	524
to apples and pears.....	833		Iodates, determination.....	712
to blueberries, Me.....	851		<i>Iodin—</i>	
to cactus.....	549		determination in presence of or-	
to cassava.....	754		ganic matter.....	504
to citrus fruits.....	60		in tuberculous tissue and thyroid	
to citrus fruits, Cal.....	449		gland.....	589
to clover.....	251		titrations, source of error in.....	805
to coconuts.....	740, 853		vapor, larvicidal value.....	359
to corn, Kans.....	529		Iodoform, insecticidal and larvicidal	
to cotton.....	539		value.....	358
to forests.....	251		Ions, absorption by living and dead	
to fruit tree leaves.....	549		roots.....	254
to imported nursery stock.....	251		<i>Iowa—</i>	
to junipers.....	450		College, notes.....	98, 396, 405
to olives.....	535		Station, notes.....	96
to onions.....	360			

# INDEX OF SUBJECTS.

965

	Page.		Page.
<i>Ipomoea leart</i> , leaf heteromorphy in.....	626	Ixalidae, biology.....	857
<i>Ips</i> ( <i>Tomicus</i> ) <i>radiata</i> n.sp., description.....	361	Jacks in Wisconsin, Wis.....	470
<i>Iridomyrmex humilis</i> , notes, N.J.....	158	Jagers, North American, distribution and migration, U.S.D.A.....	158
Iris.....		Jand forests of Punjab.....	48
borer, notes.....	752	Japanese cane. ( <i>See</i> Sugar cane.)	
leaf blotch, studies.....	354	Jasmine, yellow, poisoning of cattle by, N.C.....	80
<i>Iris germanica</i> , chondriosomes of.....	524	Jassidæ, hymenopterous parasites of.....	557
Iron.....		<i>Jassus scrotoatus</i> attacking rye.....	754
arsenate, insecticidal value, U.S. D.A.....	60	Jaundice, malignant. ( <i>See</i> Piroplasmosis, canine.)	
compounds, solubility in soils.....	720	John's disease, notes.....	184, 575
determination in mineral phosphates.....	112	Johnson grass.....	
effect on concrete sand.....	787	culture experiments, Miss.....	227
effect on permeability.....	34	eradication, Cal.....	227
salt as a corrective for cottonseed meal toxicity, N.C.....	79	eradication, N.Mex.....	735
sulphate, effect on yield of beans.....	528	grades of.....	528
sulphate, use against fly larvae, N.J.....	160	<i>Juglans californica quercina</i> , mutation in.....	236
sulphate, use against weeds, Oreg.....	228	June beetles. ( <i>See</i> May beetles.)	
Irrigation.....		Juniper plant bug, notes.....	752
canals, concrete-lined, enlarging.....	388	Junipers, insects affecting.....	450
canals, excavating with electrically driven dragline scrapers.....	885	Jute and its substitutes.....	227
canals, transmission losses in.....	387	Kafir corn.....	
canals, use of current meters in, U.S.D.A.....	281	analyses.....	865
effect on alkali soils.....	16	chop, analyses, Kans.....	169
electric pumping for.....	86	chop, analyses, Tex.....	467
in America.....	482	culture experiments, Wyo.....	630
in Bengal.....	586	fertilizer experiments, Tex.....	421
in Bihar and Orissa.....	85	from South Africa, analyses.....	530
in California.....	682	use in bread making.....	67
in Dutch East Indies.....	884	Kainit, fertilizing value.....	22, 431
in Italy.....	786	<i>Kakothrips robustus</i> , studies.....	450
in Jaunpur District.....	786	Kansas.....	
in Kansas.....	785	College, notes.....	295, 695, 900
in New South Wales.....	785	Station, notes.....	295, 495, 805, 900
in San Luis Valley, Colo.....	527	Station, report.....	693
in Texas, Tex.....	282	Kapok seed oil, hydrogenated, properties of.....	9
in United States, treatise.....	784	Kelir, preparation and use, U.S.D.A.....	474
in Valais Canton, Switzerland.....	85	Kelp.....	
in Victoria.....	682	as a source of potash.....	821
investigations, Cal.....	282	destructive distillation.....	328
practice and engineering, treatise.....	481, 482	fertilizer, analyses, Conn.State.....	521
project in Oregon.....	85	green, fertilizing value, Cal.....	219
projects in Russia.....	85	of Pacific coast, size of.....	623
pumps for.....	482	physiological conditions in.....	429
reservoirs, evaporation and seepage from.....	387	Kentucky.....	
systems, maintenance.....	482	Station, notes.....	96, 496
water. ( <i>See</i> Water.)		Station, reports.....	694
with silt-carrying water.....	513	University, notes.....	96, 496
Isoprene from $\beta$ -pinene.....	502	Kerosene.....	
Itomside of New York.....	752	illuminating power.....	488
<i>Itoplectes conquisitor</i> , parasitic on bud moth.....	250	trap, use against Mediterranean fruit fly.....	360
<i>Iso xanthifolia</i> , analyses, N.Dak.....	30	Kinghead.....	
		analyses, N.Dak.....	39
		effect on baking quality of wheat, U.S.D.A.....	558
		Kjeldahl distillation apparatus, description.....	10, 203
		Koumiss, preparation and use, U.S. D.A.....	474

	Page.	Land—Continued.	Page.
<b>Lablab—</b>		tenure and conveyances in Mis-	
culture and characteristics, U.S.		souri.....	489
D.A.....	438	use by agricultural high schools.....	384
culture in Egypt.....	232	use in common in Bavaria.....	690
<b>Laborers—</b>		waste, reclamation.....	22
farm. (See Agricultural labor-		<b>Landscape gardening—</b>	
ers.)		prairie spirit in, Ill.....	528
sleeping house for, U.S.D.A.....	229	treatise.....	45, 429
<b>Laccase, oxidizing influence on vege-</b>		<b>Lanthanum, effect on permeability—</b>	
<b>table chromogens.....</b>	33	<i>Lophygma frugiperda</i> . (See Army	34
<b>Lace-wing, brown, notes.....</b>	357	worm, fall.)	
<b>Lachnosterna impicata, notes.....</b>	753	<b>Larch—</b>	
<b>Lactic acid—</b>		leaf disease, notes.....	849
bacteria, classification.....	76	mistletoe, injurious effects, U.S.	
bacteria in milk, origin.....	473	D.A.....	547
bacteria, use in ensiling beet		western, volume tables for.....	641
tops.....	767	<b>Lard—</b>	
determination in urine.....	613	digestibility.....	656
<b>Lactose—</b>		digestibility, U.S.D.A.....	364
determination.....	611	<b>Larkspur, anthocyan of.....</b>	709
determination in milk.....	506	<b>Larvæ, rearing.....</b>	651
heated, nutritive value.....	369	<b>Laryngo-tracheal catarrh in horses</b>	489
<b>Lady beetles—</b>		<b>Lasiodiplodia, nonvalidity of genus</b>	242
control of aphids by, Va.Truck..	555	<i>Lasiodiplodia—</i>	
introduction into California.....	391	<i>trifloræ</i> n.sp., studies, Ga.....	748
life history and habits, Va.		<i>tuberculata</i> , studies.....	242
Truck.....	555	<i>Lasioptera fructuaria</i> n.sp., descrip-	
<b>Lelaps multispinosus, notes.....</b>	66	tion, Me.....	852
<b>Lagarotis</b> n.sp., descriptions.....	456	<b>Lassus (Acanthomyces) interjectus,</b>	
<b>Lagerstræmia parviflora, notes.....</b>	239	remedies.....	62
<b>Lamæ Experiment Station, notes.....</b>	635	<b>Lathromeroides neomexicanus</b> n.sp.,	
<b>Lamb, composition and nutritive</b>		description.....	556
<b>value.....</b>	256	<b>law of minimum, notes.....</b>	218
<b>Lambs—</b>		<b>Lawns—</b>	
feeding experiments.....	663	bibliography.....	228
feeding experiments, Nebr.....	567	preparation and care, Iowa.....	836
unborn, disease of.....	275	<b>Lead—</b>	
(See also Sheep.)		arsenate, analyses, Mich.....	428
<b>Lamb's-quarters, analyses, N.Dak....</b>	39	arsenate, analyses, N.J.....	658
<b>Laminitis, paper on.....</b>	576	arsenate, fungicidal value, N.J.....	146
<b>Lamtoro as shade for coffee.....</b>	535	arsenate, insecticidal value.....	548
<b>Land—</b>		arsenate, insecticidal value, N.J.	146
grant colleges. (See Agricul-		U.S.D.A.....	60
tural colleges.)		arsenate, use in agriculture.....	851
grants in United States, trea-		detection in water.....	419
tise.....	594	nitrate, effect on sugar beets.....	38
holding systems in England.....	689	removal from water.....	890
irrigated, drainage.....	86, 483	<b>Leaf—</b>	
muck, improvement.....	885	miners, monograph and bibliog-	
plaster. (See Gypsum.)		raphy.....	553
problem in Texas.....	488	mold, analyses, Conn.State.....	521
public, administration in Minne-		<b>Leaves—</b>	
sota.....	594	as a source of potash.....	327
public, settlement in United		sentle changes in, N.Y.Cornell..	222
States.....	892	<b>Legumes—</b>	
registration, Torrens system.....	489	as food.....	194
renting in England, Scotland,		culture experiments, Oreg.....	228
and Ireland.....	689	culture experiments, Wash.....	735
settlement in America.....	482	effect on composition of cereals.....	226
settlement in British Empire.....	594	hybridization experiments, Oreg.....	228
settlement in upper Wisconsin,		pentosans of, Tex.....	168
Wis.....	431	varieties, Wash.....	735
surveying in Queensland.....	800	wild, culture experiments, P.R.....	736
surveying, treatise.....	485		
swamp, reclamation.....	537		

	Page.		Page.
Leguminous seeds, hard, germinability.....	225	Lime—Continued.	
<i>Lema melanopus</i> , life history and control.....	857	fertilizing value.....	621
Lemon—		fertilizing value, N.J.....	132
cottony rot, studies, Cal.....	749	fertilizing value, Ohio.....	520
gum diseases, treatment, Cal.....	240	fertilizing value, Pa.....	129
wither-tip, notes, Cal.....	241	for alfalfa, Del.....	138
Lemons—		hydrated, in concrete road construction.....	787
frozen, composition.....	365, 502	importance in plant and animal nutrition.....	662
jelly from, Cal.....	207	inspection law in Maryland.....	426
<i>Leucites sepiaria</i> , effect on green-heart.....	56	long continued use, Pa.....	128, 132
leopard moth, notes, U.S.D.A.....	755	magnesia ratio in soil amendments.....	821
Lepidoptera—		mixing with flowers of sulphur-niter. (See Calcium nitrate.)	51
new, of Antilles.....	64	nitrogen. (See Calcium cyanamid.)	
new, of Mexico.....	64, 855	requirements of soils.....	221, 814
of Hawaii.....	556	resources of Pennsylvania, Pa.....	133
of Panama Canal Zone.....	855	shaded, fertilizing value.....	725
of Yale-Dominican expedition.....	855	sterilization of water by.....	286
Lepidopterous larvae, hypopharynx.....	558	tree winter moth, notes.....	752
Lepidosaphes—		use in agriculture.....	27, 426
beckii. (See Purple scale.)		use with barnyard manure, Pa.....	128
ulmi. (See Oyster-shell scale.)		washes, winter application.....	253
<i>Leptinotarsa decemlineata</i> . (See Potato beetle, Colorado.)		waste from acetylene gas plant, analyses, Conn.State.....	521
<i>Leptobyrus explanata</i> , studies.....	451	Lime-sulphur mixture—	
<i>Leptospheria—</i>		analyses, Mich.....	438
<i>comithyrium</i> , relation to apple canker.....	653	analyses, N.J.....	639
<i>herpoirichoides</i> , studies.....	244	methods of analysis.....	806
<i>Leptothyrus caespicum</i> n.sp., notes.....	842	self-boiled, fungicidal value, N.J.....	146
Lepidodora. (See Clover, Japan.)		Limekiln ashes, analyses, Conn.State.....	521
Lettuce—		Limes—	
fertilizer experiments.....	520, 821	budding on sour orange stock.....	438
fertilizer experiments, Ill.....	532	die-back of.....	750
<i>Lescaia plauca</i> as shade for coffee.....	535	diseases of.....	545
<i>Leucaspis japonica</i> , notes.....	752	fertilizer experiments.....	438
Leucite as a source of potash.....	328	gall or knot of.....	349
Leucocytes, fixation of toxin by.....	275	industry in West Indies.....	438
Lice, body, remedies.....	356, 854	new species from Australia.....	235
Lichens as a food for animals and men.....	164	Limestone—	
Light, effect on plant growth.....	223	deposits in South Carolina, S.C.....	725
(See also Sunlight.)		effect of fineness of subdivision.....	821
Lightning—		effect of fineness of subdivision, Pa.....	133
crushing of copper tube by, U.S.D.A.....	118	ground, analyses, Conn.State.....	521
protection against.....	416	ground, effect on composition of barley, N.J.....	132
rods, efficacy.....	416	ground, effect on decomposition of green manure, N.J.....	130
strokes, data on.....	510	ground, fertilizing value.....	725
<i>Myzus ruficeps</i> . (See Sugar-cane beetle.)		ground, fertilizing value, N.J.....	132
Uly-of-the-valley, forcing experiments.....	835	ground, notes, Wash.....	204, 796
Lime—		methods of analysis.....	609
analyses.....	426, 726	mixing with superphosphate.....	26
cost of, Ohio.....	520	of New York, N.Y.State.....	725
effect on bacterial activity of soils.....	623	tester, description, Ill.....	806
effect on composition of crimson clover, N.J.....	132	Liming—	
effect on grapes.....	221	effect on nitrogen content of soy beans, N.J.....	632
effect on moor soils.....	18	experiments.....	725
effect on strawberries, Pa.....	150	experiments, Pa.....	132, 133
		notes, Wash.....	294

	Page.	Locusts—	Page.
<i>Limnophora septemnotata</i> , hibernation.....	254	analyses.....	604
Linseed meal—		control in Malay.....	254
analyses..... 72, 263, 371,	566	fertilizing value.....	854
analyses, Ind.....	263	migratory, in South America.....	554
analyses, Kans.....	169	Log rules, limitations and corrections.....	538
analyses, Mass.....	437	Loganberry wilt, description.....	55
analyses, N.H.....	169	<i>Lonchaea anea</i> , notes.....	356
analyses, N.J.....	665	<i>Lopholatilus chamaeleonticeps</i> , notes.....	557
analyses, Vt.....	371	<i>Lophophora williamsii</i> , studies.....	336
effect on milk and butter.....	471, 570	<i>Lophyrus simile</i> in Connecticut.....	363
for skim-milk fed calves, Cal.....	285	Louisiana Stations, notes.....	456
Lint, determination in cotton-seed meal.....	13	Lucern. (See Alfalfa.)	
Lipase of soy beans.....	111	<i>Lucilia sericata</i> , notes.....	554
<i>Liponyesus</i> n.spp., descriptions.....	66	Lumber—	
Liquids—		accounting, notes, U.S.D.A.....	896
determination of reaction in surface condition, U.S.D.A.....	712	industry in Java and Madoera.....	239
	414	kiln drying.....	152
Lithium in soils.....	323	resources of Texas, conservation.....	489
<i>Lithocolletis gauthieriella</i> , notes.....	651	(See also Timber and Wood.)	
Little leaf, studies, Cal.....	248	Lumpy jaw. (See Actinomycosis.)	
Live stock—		Lunar periods, effect on climate.....	14
breeding in Brazil.....	371	Lunches—	
breeds of, text-book.....	866	for school children.....	257, 661
conditions and losses in Selby smoke zone.....	278	for school children, U.S.D.A.....	861
definition of "breed".....	466	Lungworms—	
diseases, control in Hawaii.....	477	studies.....	876
diseases in Imperial Valley, Cal.....	274	thread, in goats, Cal.....	274
diseases, notes.....	383	<i>Luperodes varicornis</i> , notes.....	555
diseases, state control.....	181	Lupine forage, effect on milk and butter.....	570
function in agriculture.....	305	Lupines—	
importation problems in Philippines.....	274	absorption and secretion of salts by.....	224
in United States.....	393	growth in distilled water.....	827
insects affecting.....	651	sensitiveness to calcium.....	734
marketing..... 305, 399		Lupinosis in horses.....	583
parasites, control.....	306	<i>Lychnis dioica</i> , chemistry and anatomy of.....	522
poisoning by sugar beets.....	80	<i>Lygidea mendax</i> —	
poisoning on plants of sorghum group, Okla.....	577	notes.....	752
prices in India.....	195	notes, N.J.....	153
production, treatise.....	565	oviposition.....	255
remedy law of Kansas, Kans.....	169	studies, N.Y.Cornell.....	754
sanitary control work in Canada.....	184	<i>Lygus</i> —	
sanitation, problem in.....	274	<i>invitus</i> , oviposition.....	256
statistics at United States markets.....	291	<i>pratensis</i> . (See Tarnished plant bug.)	
statistics in foreign countries.....	490	Lymphangitis—	
statistics in France.....	691	epizootic, in horses.....	384
statistics in India.....	595	in horses, causative organism.....	480
statistics in Ireland.....	291	ulcerative, disease simulating in horses and calves.....	186
statistics in Tunis.....	595	Lymphatic glands in meat-producing animals, treatise.....	876
statistics in United States, U.S.D.A.....	690	Lysin, rôle in nutrition of chicks, Ky.....	871
(See also Animals, Cattle, Sheep, etc.)		Macaroni wheat. (See Wheat, durum.)	
Liver distomiasis in Japan.....	558	Machinery. (See Agricultural machinery.)	
Locust—		<i>Macrodaetylus subspinosus</i> . (See Rose chafer.)	
borer, remedies.....	757	<i>Macronoctua onusta</i> , notes.....	752
Invasions in Jerusalem.....	854		

# INDEX OF SUBJECTS.

969

	Page.	Man—	Page.
Macrophages of mammals, definition.	382	digestion experiments.....	659
<i>Macrophoma tumefaciens</i> n.sp., description.....	448	insects affecting.....	651
<i>Macrospogon</i> —		measurement of surface area.....	68
<i>faripennis</i> , notes.....	557	metabolism experiments.....	68
<i>octonucleatus</i> , notes.....	455	plague-like disease of brown squirrels affecting.....	355
<i>Macrosiphum</i> —		respiration experiments.....	260
<i>heucheræ</i> , notes.....	453	Mandarin tree brown spot, notes....	644
<i>psii</i> , remedies.....	755	Manganese—	
<i>psii</i> , studies, U.S.D.A.....	62	as a plant food.....	306
<i>rolanifolii</i> , studies, Me.....	550	carbonate, fertilizing value.....	331
<i>Macrosporium</i> sp. on tomatoes.....	644	compounds, effect on nitrification.....	623
Madia cakes, effect on milk.....	570	effect on nodule bacteria of legumes.....	31
Magnesia, effect on sugar beets.....	38	effect on sugar beets.....	38
Magnesium—		occurrence in wheat, U.S.D.A.....	339
carbonate, effect on development of <i>Digitaria purpurea</i> .....	135	sulphate, fertilizing value.....	331, 632
carbonate, effect on strawberries, Pa.....	150	Mange, parasitic, in Great Britain....	382
determination.....	712	(See also Horse scab and Sheep scab.)	
glycerophosphate, use against tetanus.....	782	Mangel—	
salts, effect on canned foods.....	67	crown gall, notes.....	844
salts, effect on germination and growth of crops, U.S.D.A.....	125	leaves as a source of potash....	327
Maize—		Mangels—	
Station, notes.....	496, 600	culture experiments, Can.....	34
University, notes.....	96, 396, 600, 900	culture experiments, U.S.D.A.....	223
Malze. (See Corn.)		effect on milk and butter.....	570
<i>Malacosoma</i> —		fertilizer experiments.....	519
<i>americana</i> . (See Tent caterpillar.)		r. silage for milk production, Ohio.....	670
<i>disstris</i> . (See Forest tent-caterpillar.)		varieties.....	865
Maladie du colt. (See Dourine.)		varieties, U.S.D.A.....	229
Malaria, transmission by <i>Anopheles punctipennis</i> .....	358	Mango—	
Malic acid secretion by <i>Oicer arretinum</i> .....	523	bacterial disease, notes.....	242, 447
Mallow—		fruit disease, notes.....	442
Jews', culture in Egypt.....	232	Mangoes—	
wild, coloring matter of.....	710	culture in Philippines.....	635
Malt—		insects affecting.....	349
extract, effect on growth of rats.....	258	varieties.....	40
grains, analyses, N.J.....	665	Mani cimarrona, culture, P.R.....	736
phosphatases in.....	502	Manioc. (See Cassava.)	
sprouts, analyses.....	72, 371	Manitoba Agricultural College, notes	498
sprouts, analyses, Ind.....	263	Mannite, antizymotic action.....	815
sprouts, analyses, Mass.....	467	Manual training—	
sprouts, analyses, N.J.....	665	in graded schools.....	599
sprouts, effect on milk.....	471	in rural schools.....	395
valuation.....	318	Manure—	
Maltose—		analyses and use, S.C.....	519
determination.....	611	barnyard. (See Barnyard manure.)	
effect on action of alcohol on plant cells.....	333	boron-treated, use, U.S.D.A.....	626
Malvin, studies.....	710	effect on composition of meadow hay.....	620
Mammals—		effect on decomposition of green manure, N.J.....	129
macrophages of.....	382	freight rates on.....	392
new, of Mexico and Arizona.....	850	liquid, as a source of potash.....	327
of Great Britain, treatise.....	57	liquid, composition.....	23, 24
of lower Colorado Valley.....	547	liquid, fertilizing value.....	23, 820
		liquid, loss of nitrogen from.....	517
		liquid, utilization.....	298
		reinforcing with phosphates.....	621
		residual value, determination....	22
		treatise.....	716
		(See also Cow, Poultry, etc.)	

Maple—	Page.	Meat—Continued.	Page.
discoloration in kiln.....	509	meal, analyses.....	283, 371, 509
leaf-hopper, notes.....	752	meal, analyses, Ind.....	283
scale, false, notes.....	752	meal, analyses, N.H.....	169
syrup, adulterated, detection.....	807	meal, analyses, N.J.....	842
sugar, analyses.....	480	meal, analyses, Tex.....	447
twig pruner, notes.....	752	meal, detection in fish meal.....	447
Marasmius—		meal for horses.....	789
perniciosis n.sp., description.....	847	flour, preparation and proper-	
sacchari, notes.....	442, 539, 841	ties.....	149
Margarin, detection in butter.....	13	poisoning, papers on.....	575
Margaropus annulatus. (See Cattle		poisoning, relation to puerperal	
ticks.)		disease of cattle.....	394
Market garden experimental and re-		production in United States.....	397
search station in Hertfordshire....	199	production on high-priced lands	
Marketing—		of middle West.....	398
and distribution, courses in.....	307	products, water content.....	365
associations in Posen and West		putrefaction.....	162
Prussia.....	893	scrap, analyses.....	371, 797
car-lot distribution in.....	893	scrap, analyses, Ind.....	223
pamphlet.....	595	scrap, analyses, Mass.....	467
Marl deposits in South Carolina, S.C.		scrap, analyses, N.H.....	180
Martin slag, basic, fertilizing value.	725	scrap, analyses, Tex.....	467
Martynia louisiana seeds, composi-		scrap, analyses, Vt.....	321
tion.....	311	scrap for laying pullets, N.J.....	177
Maryland Station—		tuberculous, inspection.....	576
notes.....	695	Mechanical colleges. (See Agricul-	
report.....	95	tural colleges.)	
Masiceratitis, new in South America.	65	Mediterranean—	
Massachusetts—		coast fever, studies.....	353
College, dedication of Stock-		flour moth in soldiers' biscuits.	251
bridge Hall.....	597	Megalonectria pseudotrichia, notes....	549
College, notes.....	98,	Megarhyssa, studies.....	773
198, 295, 496, 600, 605		Megilla maculata, life history and	
Station, notes.....	198, 295	habits, Va.Truck.....	555
Station, report.....	294	Melampus lini, biology.....	139
Mato de la playa, culture, P.R.....	730	Melanconium sacchari, notes.....	349
Matraca, culture, P.R.....	736	Melanogaster variegatus broomiana,	
Matthiola incana annua as a host of		notes.....	548
celworm.....	349	Melanoplus spp., remedies, U.S.D.A.	135
Matthiola, inheritance of double-		Melilose—	
ness in.....	237	acetates of.....	408
Mauromyia pulla, notes.....	564	preparation.....	408
May beetles—		Melilotus indica as a green manure,	
bird enemies of, U.S.D.A.....	849	Cal.....	35
larvæ in greenhouse soils, N.J....	161	Melolontha spp., remedies.....	454
notes.....	752	Melons, stock, culture, Colo.....	659
notes, N.J.....	158	Mendelism, review of investigations.	564
(See also White grubs.)		Menesta albiciliella, life history.....	64
Mayetiola destructor. (See Hessian-		Mercury, detection in water.....	419
fly.)		Merulus—	
Meadows, fertilizer experiments.....	820	lacrymans, effect on greenheart.	54
(See also Grass.)		sylvestris, studies.....	547
Meal worm, life history.....	65	Mesogramma polita, life history.....	575
Mealy bugs—		Metabolism experiments—	
in Hawaii.....	59	with infants.....	68, 492
in Ohio, Ohio.....	59	with men.....	8
Ontario, in California.....	62	Metallonoida britannica n.subg. and	
Measles in live stock.....	185	n.sp., description.....	357
Meat—		Metamasius sericeus, notes.....	453
and blood meal for horses.....	869	Meteorological observations—	
export trade of Australia.....	767	Kansas.....	528
horse. (See Horse meat.)		Ky.....	615
inspection in United States.....	185	Mass.....	118, 414, 714
marketing.....	305	N.J.....	244
markets, inspection in Indiana.....	861	N.Y.State.....	118

# INDEX OF SUBJECTS.

971

	Page.		Page.
Meteorological observations—Contd.		<i>Microbracon hemimene</i> n.sp., de-	
Ohio.....	118	scription.....	456
Oreg.....	208	<i>Microcitrus</i> n.g. and n.spp., descrip-	
Pa.....	115, 118	tions.....	235
U.S.D.A.....	117, 413, 414, 614, 615	( <i>Microtus</i> ) <i>Bassus carinoides</i> , para-	
Wyo.....	615	sitic on bud moth.....	250
at Wisley.....	14	Microlepidoptera—	
in Michigan.....	714	injuriously to fir and spruce.....	855
in Sweden.....	510	new genera and species from	
(See also Climate, Rain,		Panama.....	855
Weather, etc.)		Micro-organisms—	
Meteorology—		biochemical activity.....	32
agricultural, in foreign coun-		in dried fruits and vegetables.....	460
tries.....	504	(See also Bacteria.)	
agricultural, in Great Britain.....	319	<i>Microspira desulfuricans</i> , notes.....	217
agricultural, in Russia.....	207	Middlings—	
agricultural, in U.S. Weather Bu-		analyses.....	263, 371, 566
reau.....	601	analyses, Ind.....	263
agricultural, international im-		analyses, N.H.....	168
portance.....	207	analyses, Wyo.....	469
agricultural, review of investi-		(See also Wheat, Rye, etc.)	
gations.....	714	Midges of Illinois.....	654
antarctic, U.S.D.A.....	118	Military hygiene and sanitation,	
application to agriculture.....	606	text-book.....	369
at Pan American Scientific Con-		Milk—	
gress, U.S.D.A.....	615	albumin, in infant feeding.....	258
effect on forest types.....	640	and milk products, manual.....	380
effect on plant diseases.....	840	artificial, preparation.....	558
in Brazil.....	413	as affected by feeding stuffs.....	471,
in California.....	509	570, 671	
in Canada.....	208	bacteria, description.....	776
in Netherlands and vicinity,		bacteria, significance.....	672
U.S.D.A.....	614	biorization.....	875
meaning of "fair" in, U.S.D.A.....	615	biorizing c. pasteurizing.....	572
papers on.....	308	boiled, nutritive value.....	659
relation to grape culture.....	234	boiling.....	572
relation to winter rye culture.....	715	certified, cost of production.....	380
text-book.....	13	certified, improvement.....	271
world bureau of.....	14	clarification.....	671
yearbook.....	494	coagulability and digestibility.....	611
rhacotin, periodids of.....	502	coagulation.....	380
rhopl—		composition and characteristics.....	380
alcohol, pathological effects on		composition as affected by cal-	
human system.....	662	cium phosphate in rations.....	270
glycerol, effect on plant growth.....	31	condensed, sediment in.....	503
salicylate, insecticidal and lar-		contamination, elimination.....	185
vicidal value.....	359	contests, U.S.D.A.....	874
ethylene blue—		cost of production.....	299, 380
action on abortion bacilli.....	679	cost of production, N.Y. Cornell.....	771
solution, preparation.....	612	cost of production in relation to	
as a source of potash.....	328	size of cows, Wash.....	773
deposits in Georgia.....	328	deposit from in centrifuge.....	271
breeding experiments.....	864	determination of degree of ho-	
field, destruction by snakes.....	751	mogenization.....	612
field, dissemination and control		determination of manurial pol-	
in Bavaria.....	850	lution.....	272
grasshopper, notes.....	850	diffusible, phosphorus of.....	271
inheritance of spotting in.....	466	dried, as a substitute for whole	
of Great Britain.....	57	milk.....	459
white, heredity in.....	370	evaporated, coagulation, Iowa.....	78
nigan—		examination, Me.....	76
College, notes.....	96, 695, 797	farinaceous, definition and	
Station, report.....	795	analyses.....	365
50633°—16—7		fat as a growth stimulant for	
		young animals.....	561

Milk—Continued.	Page.	Milk—Continued.	Page.
fat as a measure of value of milk	671	sanitary, production	184, 77
fat as affected by acetic acid	507	sanitary, production, U.S.D.A.	79
fat globules as affected by temperature	570	secretion as affected by barley, Cal	58
fat, 7-day test, reliability	472	secretion as affected by pituitrin skimmed. (See Skim milk.)	27
fat, variations due to time of milking	670	slimy and ropy, studies	67
(See also Fat.)		sour, for chicks, N.C.	77
fermented, studies, U.S.D.A.	474	sour, for chicks, N.J.	17
fever, pathology	184	souring, chemical changes in, N.Y.State	89
flow as affected by diuresis, U.S.D.A.	570	specific gravity	31
from different quarters of cow's udder	270	sterilization	472
from heifers and cows, fat content	472	sterilized, relation to rachitis and scurvy in infants	77
frozen, analyses	473	substitutes for calves, Ind.	74
germ content as affected by stable air, N.Y.State	183, 473	substitutes for calves, Mass.	67
gent's, composition, N.Y.State	708	sugar, rôle in judging milk	111
heated, loss of nutritive efficiency	368	supply, improvement	575, 57
high & low testing, for cheese making	473	supply in United States	74
houses, construction, Wash.	789	supply of cities, inspection	14
human, artificial substitute for	558	valuation	67
human, chemistry of	461	variation in	278
human, green color in	863	Milking—	
immunized, use against typhoid fever	272	at unequal periods	579, 67
inspection in Kentucky, Ky.	775	methods	26
judging	12, 113	machines, tests	56
keeping quality during transportation	672	machines, tests, Pa.	16
methods of analysis, U.S.D.A.	713	Mill feed, analyses, Wyo.	66
nutritive value	164	Millet—	
organisms, yellow, studies, Iowa	77	breeding for drought resistance, U.S.D.A.	53
pall, sanitary, description, Ky.	571	culture, Colo.	69
pasteurization	572	fertilizer experiments	59
pasteurization, U.S.D.A.	571	fertilizer experiments, Tex.	45
pasteurization in Denmark	874	grain, as a feeding stuff	56
pasteurized, microscopic test	113	smut, treatment	59
powder, preservation, U.S.D.A.	474	water requirements, Wash.	79
production and inspection in New England	380	Milo maize—	
production as affected by oestrum, Ky.	670	chop, analyses, Kans.	16
production in United States, U.S.D.A.	630	chop, analyses, Tex.	46
production, inheritance	671	spacing experiments, U.S.D.A.	29
production, relation to conformation	379	use in bread making	6
production, relation to escutcheon, Ky.	670	<i>Mimosa pudica</i> , fertilizing value	31
protein-free, preparation	557	<i>Mimosa</i> , velocity of transmission of excitation in	2
protein, preparation	461	<i>Mineola vaccinii</i> . (See Cranberry fruit-worm.)	
raw, for infants	659	Mineral—	
raw, pasteurized, and boiled, resistance to infection	272	resources of Texas, conservation	48
reaction and calcium content as factors in coagulation	611	salts, rôle in plant life	13
relation to septic sore throat	473	Minerals of United States, analyses	23
rooms, plans	487	Minnesota—	
ropiness in	76, 776	Station, notes	78
sanitary control	77	University, notes	496, 78
		Mint—	
		cultivated, degeneration	4
		culture, U.S.D.A.	131
		Mississippi Station, notes	69
		Missouri—	
		Poultry Experiment Station	88
		notes	96, 138, 63
		Station, notes	96, 138, 63
		University, notes	96, 138, 63, 88

	Page.		Page.
Mistletoe—		Mowrah seed, composition and nu-	
composition, Cal.....	262	tritive value.....	565
injurious to larch, U.S.D.A.....	547	Mucinase in yams.....	312
Mite, purple, notes.....	60	Muck—	
Mites, monograph, U.S.D.A.....	458	analyses, Conn.State.....	521
Mitochondria, rôle in heredity.....	629	analyses and use, S.C.....	519
<i>Mycophora neoclyti</i> n.sp., descrip-		<i>Mucor</i> —	
tion.....	456	<i>racemosus</i> and <i>Empusa musca</i> ,	
Moisture—		relationship.....	254
distribution in the atmosphere,		spp. on citrus.....	446
U.S.D.A.....	117	<i>Mucuna</i> sp., fertilizing value.....	34
hygroscopic, determination in		Mulberry—	
soils.....	712	blight in South Africa.....	649
(See also Water.)		scale, control by parasites.....	456
Molasses—		white fly, notes.....	752
analyses.....	660	Mules—	
as a feeding stuff.....	569, 566	inspection and disinfection for	
beet, inversion of.....	13	interstate shipment.....	185
beet pulp. (See Beet pulp.)		sterility in.....	568
feed, analyses.....	263, 566, 787	<i>Murgantia histrionica</i> , (See Harle-	
feed, analyses, Ind.....	263	quin cabbage-bug.)	
feed, analyses, Mass.....	467	Muriate of potash. (See Potassium	
feed for dairy cattle.....	671	chlorid.)	
meal, analyses, N.H.....	169	Muridæ of Great Britain.....	57
Mole cricket—		<i>Musca</i> —	
bird enemies of, U.S.D.A.....	849	<i>corvina</i> , hibernation.....	254
European, in New Jersey.....	653	<i>domestica</i> , (See House-fly.)	
injurious to rice.....	61	<i>Musca</i> , misuse of generic name.....	253
Moles—		Muscidæ with bloodsucking larvæ.....	555
American, monograph, U.S.D.A.....	158	<i>Muscina</i> spp., hibernation.....	254
insectivorous habits.....	58	Muscoid flies—	
Mylab acid, recovery.....	204, 608	new genera.....	554, 555, 835
<i>Mythrapapilio bazi</i> , notes.....	64, 732	of Peru.....	655
<i>Myia</i> sp. on fruit trees in Oregon.....	351	Muscoidea—	
<i>Myiopsopis nderholdti</i> , notes.....	749	acalyptate genus of.....	65
<i>Myiophanes infuscans</i> —		new, from West and Southwest.....	855
studies, Del.....	156	new, in Canada and Alaska.....	65
studies, U.S.D.A.....	646, 747	synonymical notes.....	360, 554
<i>Myiophanes secundus</i> n.sp., descrip-		Muscovite—	
tion.....	363	potash from.....	425
monosaccharide, determination, Bar-		potash, solubility.....	328
ford's test.....	411	Mushrooms—	
Ontana College and Station, notes.....	97	analyses.....	761
Oon—		loss in blanching.....	256
effect on weather.....	509	treatise.....	532, 761
internal structure, U.S.D.A.....	614	Muskmelon—	
our soils. (See Soils, moor.)		culture in North Carolina.....	41
ouring glory, eradication, Oreg.....	228	grading, packing, and shipping,	
orphin, detection in water.....	410	U.S.D.A.....	737
ortus, fungicidal value.....	843	marketing, U.S.D.A.....	340, 737
osquito—		Musk rats in Bohemia.....	58
larvæ, destruction by ducks.....	856	Mustard—	
sanitation, pioneers in.....	453	fertilizer experiments.....	25, 327, 820
osquitoes—		fertilizer experiments, Tex.....	421
as winter carriers of malaria.....	856	oil, insecticidal value.....	359
breeding.....	358	white, as a green manure.....	631
control in Connecticut, Conn.		white, effect on milk and but-	
State.....	856	ter.....	570
control in New Jersey, N.J.....	160	wild, eradication, Oreg.....	298
eradication.....	358, 553	yield as affected by sulphur.....	726
of New Jersey, N.J.....	64	Mutation—	
of North America, monograph.....	453	and heredity as cell phenomena.....	823
respiration of.....	756	in plants, treatise.....	629
lots. (See Lepidoptera.)		<i>Mutilla</i> spp., notes.....	556
lotor plow. (See Plows.)			

Mutton—	Page.	Nephelometry, review of investiga-	Page
composition and nutritive value	259	tions	290
fat, digestibility, U.S.D.A.	364	Nevada—	
fat, digestion and absorption	257	Station, notes	336, 486, 606
tallow, solidifying and melting		University, notes	229
points	201, 202	New Hampshire College, notes	97
<i>Mycetolus</i> n.sp., notes	381	New Jersey—	
Mycetophilid larva, dipterous para-		College, notes	97, 295, 496, 738
site of	553	Stations, notes	97, 295, 496, 738
<i>Mycospharella brassicicola</i> , notes	49, 542	Stations, report	195
<i>Myelophilus piniperda</i> in New Jersey	355	New Mexico—	
Myiasis in man and animals, trans-		College and Station, notes	606
mission by flies	359	Station, report	745
Myiophasia, revision	360	New York—	
Myriapods, migrating armies of	364	Cornell Station, report	765
Myrtilin, studies	709	Department of Foods and Mar-	
<i>Mytilidion</i> n.sp., on Picca	58	kets, work of	494
<i>Myzocallis pasanae</i> n.sp., description	433	State Agricultural Society	258
<i>Myzus braggi</i> and <i>Rhopalosiphum</i>		State Station, guide to build-	
<i>lapponei</i> , confusion	357	ings and grounds	95
<i>Nabis ruficollis</i> , studies, Me.	853	State Station, notes	97, 199, 606
$\beta$ -Naphthol, larvicidal value	359	State Station, report	195
$\beta$ -Naphthylamin, larvicidal value	359	Nickel, occurrence in hydrogenated	
Narcosis, local and general	576	oils	19
National—		Nicotiana—	
Agricultural Society	799	factors affecting flower size in	955
Association of Cement Users	685	parthenogenesis, parthenocarp,	
conference on church and coun-		and phenospermy in	198
try life	297	Nicotin—	
Dairy Council, purpose and		preparations, combining with	
work of	472	spray mixtures, N.J.	158
Nature study—		sulphate, use with Bordeaux	61
in elementary schools	597	Niger-seed cake, effect on milk and	
in Geneseo schools, Illinois	899	butter	579
in New York State College of		Niter spots, origin in soils	811, 812
Agriculture	692	p-Nitranilin, insecticidal value	375
manual	599	Nitrate—	
outlines	794, 795	deposits in Idaho and Oregon	229
training for teachers	692	diphosphate, fertilizing value	527
Nebraska—		Norwegian. (See Calcium ni-	
Forestation Commission, report	347	trate.)	
Station, notes	798	of lime. (See Calcium ni-	
Station, report	294	trate.)	
University, notes	198, 398, 798	of soda. (See Sodium nitrate.)	
Necrobacillosis, umbilical, in lambs	188	Nitrates—	
<i>Nectandra rodiaei</i> , durability tests	56	analyses	222
Nectarines, pollination experiments	233	determination in soils	112
Nectria—		determination in soils, Iowa	521
<i>ditissima</i> , notes	247	formation in presence of carbo-	
<i>rubi</i> , studies	352	hydrates, N.J.	125
sp. on Norway maple, N.J.	157	in chernozem soils	615
spp. on cacao	540	titration with ferrous sulphate	280
Nematodes—		Nitrification—	
in digestive tract, treatment	576	as affected by manganese	629
injurious to coffee	55	in Philippine soils	478
injurious to oranges	354	in plants	425
injurious to ornamental plants	249	in soils	127
injurious to sugar cane and		in soils, Pa.	628
bananas, U.S.D.A.	50	in soils, U.S.D.A.	628
parasitic in sheep	275	Nitrobenzene, insecticide and larvi-	
parasitic on plants	841	cidal value	559
treatment	780	Nitrogen—	
treatment, Mich	245	aliphatic amino, determination	688
<i>Nematosius filicollis</i> , life history	187	amino-acid, determination	590
<i>Neosiphia coulteri</i> , notes	56	amino-acid, in soils	593
Nephele potash, solubility	328	amino, determination	593

# INDEX OF SUBJECTS.

975

Nitrogen—Continued.		Page.			Page.
summons, determination in			Nutmeg thread blight, notes	841	
urine	613		Nutrition—		
atmospheric, utilization by rad-			animal. (See Animal nutri-		
ishes	218		tion.)		
availability in mineral and or-			effect on growth of the brain	662	
ganic compounds, N.J.	621		effect on sexual development of		
cycle in nature	423		plants	824	
determination	10,504		Laboratory of Carnegie Insti-		
determination in vegetable mat-			tution, report	764	
ter	410		plant. (See Plant nutrition.)		
determination in waters and ef-			review of investigations	72	
fluents	410		summary and digest of data	255	
fixation in soils	422, 423		treatise	658	
fixation in soils, U.S.D.A.	619		value of extractives in	258	
free amino, in proteins of ox			(See also Digestion, Metabol-		
and horse serum	501		ism, etc.)		
in humus of arid soils, U.S.D.A.	719		Nuts—		
in processed fertilizers	327		culture experiments, U.S.D.A.	231	
in seeds of <i>Acacia pycnantha</i>	729		varieties, U.S.D.A.	231	
lime. (See Calcium cyanamid.)			varieties for Georgia	436	
long continued use, Pa.	128		<i>Nymphaea alba</i> , chemistry and an-		
loss in cultivated soils	516		atomy of	522	
nitric, in chernozem soils	618		<i>Nymphula depunctalis</i> , notes	250	
transformation in moor soils	18		Oak—		
water-insoluble, in fertilizers,			honeycomb heart rot, studies,		
Mass.	625		U.S.D.A.	448	
water-soluble, in feeding stuffs.	72, 501		Oldium, studies	650	
Nitrogenous fertilizers—			reddish or brown heartwood of,		
availability, Cal.	219		studies	849	
comparison, 24, 25, 37	518, 622, 820		twig pruner, notes	752	
comparison, N.J.	129, 621, 622		Oaks—		
for arid soils	621		histological variations in	440	
for cranberries, N.J.	150		red, culture and value, Ohio	635	
for meadow soils	22		scarlet, disease of	448	
history and manufacture	423		Oat—		
manufacture	622		diet, exclusive, injurious effects	366	
use in arid regions, Cal.	219		grass, tall, moisture content		
Nitrous acid, occurrence in plant sap	627		and shrinkage, U.S.D.A.	828	
Nonelectrolytes, effect on action of			grass, tall, palatability, Ohio	865	
alcohol on plant cells	333		hulls, analyses, N.J.	665	
North Carolina—			rusts in Canada	51	
College and Station, notes	296, 496		smut, treatment, Ind.	744	
Station, report	95		straw, analyses	164	
North Dakota—			straw, composition and digesti-		
College, notes	496		bility	565	
Station bulletins, index, N.Dak.	796		Oats—		
Station, notes	798		acid poisoning due to	766	
<i>Oryz. carthagenis</i> , notes	851		analyses	630	
<i>ummalaria discreta</i> —			analyses, Wyo.	608	
effect on apple bark	136		and peas, cost of production,		
notes	247, 646		N.J.	137	
transmission by tree crickets	653		composition as affected by fer-		
urinary—			tilization and soil prepara-		
experimental and research sta-			tion	230	
tion in Hertfordshire	199		culture, Ga.	138	
inspection in Colorado	651		culture, S.C.	694	
inspection in Hawaii	59		culture experiments, Ohio	631	
inspection in New Jersey, N.J.	153		culture experiments, Oreg.	228	
inspection law in Florida	232		culture experiments, U.S.D.A.	137, 228	
inspection law in Texas	737		culture under irrigation, Colo.	528	
stock, die-back disease of	353, 646		effect on milk and butter	570	
stock, insects affecting	251		effect on soil moisture	17	
stock laws in United States and			feeding value, Tenn.	867	
Canada	40		fertilizer experiments	22, 24, 327,	
stock leaf diseases, treatment,			330, 423, 517, 518, 622, 726, 820		
N.Y.Cornell	747		fertilizer experiments, Mass.	294	

	Page.		Page.
Oats—Continued.		Oils—	
fertilizer experiments, Mich.	723	animal, effect of free fatty	
fertilizer experiments, Pa.	128, 131	acids on	312
fertilizer experiments, Wyo.	630	determination of saponification	
ground, analyses, Mass.	467	value.	449
ground, analyses, Tex.	467	essential, determination.	595
growth as affected by alkali		heat of bromination.	595
salts, U.S.D.A.	125	hydrogenated, digestibility.	650
liming experiments, Pa.	132, 133	hydrogenated, properties.	5
new, moisture content, U.S.D.A.	92	of conifers.	697
of Algeria.	36	technology and analysis,	
prices and shrinkage, Ill.	337	treatise.	561
protein content following black		Oklahoma—	
fallow	230	College, notes.	87
transpiration in.	522	Station, notes.	296
varieties, Cal.	227	Oleander poisoning in horses.	759
varieties, Ga.	138	Oleic acid and cotton-seed oil,	
varieties, Idaho.	735	hydrogenation of.	10
varieties, Ohio.	631	<i>Olethreutes (Grapholitha) schis-</i>	
varieties, Oreg.	228	<i>taceana</i> , notes.	753
varieties, U.S.D.A.	229, 733	<i>Oligostia sanguinea claripes</i> n.sp.,	
varieties, Wyo.	629	description.	556
water requirements, Wash.	720	<i>Oligotropharia</i> of New York.	732
yield as affected by sulphur.	726	Olives—	
yields, Nebr.	228	diseases and insect pests.	532
yields in relation to rainfall.	319	forests in Punjab.	533
		knot, studies, Cal.	210
Oceanic—		oil, homogenized, for infants.	258
circulation and temperatures,		pomace for pigs.	74
U.S.D.A.	615	Olives—	
noises, U.S.D.A.	117	culture.	555
<i>Oenoserotoma pinariella</i> , notes.	855	sizing, Cal.	740
<i>Odonaspis rufus</i> n.sp., description.	357	<i>Omiodes blackburni</i> in Hawaii.	59
<i>Odontoglossum crispum</i> , culture.	741	<i>Ommatothrips</i> n.g. and n.spp., de-	
<i>Oedipoda nebrascensis</i> , notes, U.S.		scriptions.	61
D.A.	158	<i>Omorgus</i> n.spp., descriptions.	363
<i>Oenophthira pilleriana</i> , notes.	63	Onchocerca—	
Enothera—		<i>gibsoni</i> , notes.	581, 582
breeding experiments.	732	sp., studies.	582
inheritance of characters in.	823	Onchocerca larva, migration through	
mutation in.	629	capsule of worm nodule.	516
seeds, germination.	135	Onchocerciasis in cattle.	581, 582
<i>Oenothera rubricaulis</i> , origin and be-		Onion—	
havior.	226	maggot, life history and	
Estrum, effect on milk and butter		remedies.	304
production, Ky.	670	maggot, notes.	252
		thrips, notes.	360, 452
Ohio—		Onions—	
State University, notes.	190, 296, 496	Bermuda, culture in south	
Station, notes.	199, 296, 695	Texas.	457
Station, report.	494	culture, N.Y. State.	41
Oidium—		fertilizer experiments, Ill.	532
<i>tingitanium</i> n.sp., description.	447	insects affecting	599
<i>tuckeri</i> , treatment.	748, 841	respiratory activities in sun-	
		light.	56
Oil—		storage experiments.	657
Chinese wood, polymerization.	607	varieties, U.S.D.A.	202
globules, elaboration in <i>Iris</i>		<i>Oospora scabies</i> . (See Potato	
<i>germanica</i>	524	scab.)	
of cassia, constituents of.	501	<i>Ophiobolus graminis</i> , notes.	54
of Chenopodium, effect on circula-		Ophiomina, generic corrections.	47
tion and respiration.	476	Ophiina, North American, revision.	
of Chenopodium, effect on in-		Opium—	
testinal contractility.	381	( <i>Biosterea</i> ) sp., parasitic on	25
of cloves, larvicidal value.	359	bud moth.	55
seeds and feeding cakes,		<i>humilis</i> , notes.	4
treatise.	565	n.spp., descriptions.	

# INDEX OF SUBJECTS.

977

	Page.		Page.
Opuntia fruits, personation and multiplication of.....	430	Oxalls, genetical studies.....	823
Orange--		Oxidase enzymes, notes.....	711
black spot, notes.....	644	Oxidases--	
scaly bark, treatment, Cal.....	240	distribution in plants.....	32
with-tip, notes, Cal.....	241	role in plant respiration.....	524
Oranges--		role in plant respiration, Md.....	523
acidity in relation to maturity, Cal.....	235	Oxidation processes in animal organism.....	663
bright v. russet fruit of.....	535	Oxygen--	
frozen, composition.....	365, 502	density, U.S.D.A.....	414
jelly from, Cal.....	207	determination in waters and effluents.....	410
maurtrity in, Cal.....	235	Oyster-shell scale--	
navel, bud mutations in.....	43	as affected by low temperature, notes, N.J.....	357
navel, improvement by bud selection and top-working.....	630	Oysters--	
navel, origin and development.....	43	packing, shipping, and sale, Ky.....	761
nematoles affecting.....	354	propagation, N.J.....	180
total solids and acidity, N. Dak.....	061	Pachybrachys, North American, revision.....	361
Orchard--		Pachypappa reaumuri, notes.....	551
grass, moisture content and shrinkage, U.S.D.A.....	828	Pachytylus sp., control in Malay.....	254
heating devices, tests.....	747	Packing-house products. (See Animal products.)	
inspection. (See Nursery inspection.)		Paddy. (See Rice.)	
Orchards--		Paints, branding, tests, Wyo.....	668
cover crop experiments, N.Mex.....	437	Palindia, notes.....	855
protection against frost.....	341	Palu--	
renovation, Can.....	341	kernel cake, analyses.....	263
Orchids canus, notes.....	254	kernel cake for cattle.....	506
Orchid leaf spot, notes.....	442	kernels, composition and nutritive value.....	565
Orchids, treatise.....	741	nut cake as a feeding stuff.....	208
Oregon--		nut cake, effect on milk.....	471, 570
College, notes.....	97, 199, 296, 497	Pan American--	
Eastern Substation, report.....	294	Road Congress.....	390, 484
Station, notes.....	199, 497, 695	Scientific Congress.....	303
Organic--		Pancreas--	
compounds, determination, treatise.....	312	ferments of.....	257
compounds, humification.....	516	role in digestion and absorption of fat.....	257
compounds of soils, effect on plant growth, Tex.....	126	Pancreatic juice, nature and properties.....	257
matter, loss in cultivated soils.....	516	Pandemis ribeana, notes.....	855
matter, oxidation in soils, Tex.....	420	Panicularia occidentalis n.sp., description.....	336
myxasms, fat containing, culture.....	763	Pantala flarescens, food habits.....	549
riganum oil, insecticidal value.....	261	Papaya disease in Barbados.....	249
temamental plants, shrubs, or trees. (See Plants, Shrubs, and Trees.)	359	Papayas, culture in Philippines.....	635
ruthopsis spp., hydrocyanic acid in.....	525	Paper pulp filter, use in quantitative analysis.....	712
ribocase potash, solubility.....	328	Papilio demoleus, notes.....	851
riphoptera of Yale-Dominican expedition.....	854	Para rubber. (See Rubber.)	
ricanus n.sp., descriptions.....	850	Paracalocoris--	
strikes, breeding and care.....	873	colon, oviposition.....	255
rithynchus sulcatus, notes.....	65	sericeps, notes.....	762
varia--		Paralipptomastix abnormis--	
extract feeding, effect on growth and sexual development.....	766	in California.....	451
tissue, transplanting in chicks.....	870	n.sp., description.....	456
rules, shortiveness in relation to pod position, N.J.....	134	Paraleurocerus divaloripes n.g. and n.sp., description.....	857
salle acid--		Parasites--	
hircidal value.....	359	intestinal, detection.....	682
secretion by Cicer arietinum.....	525	intestinal, toxins of.....	879
		(See also Animal parasites, Insect parasites, etc.)	

	Page.		Page.
Parasitism and Eosinophilia.....	278	Peaches—Continued.	
<i>Paratimonia conicola</i> n.g. and n.sp., description.....	254	pollination experiments.....	76
Parcel post—		spraying experiments, N.J.....	14
marketing by.....	392, 690, 792	supply and distribution in 1914, U.S.D.A.....	16
marketing by, U.S.D.A.....	792	varieties, N.Mex.....	72
Paresis, parturient. (See Milk fever.)		varieties for Pennsylvania, Pa.....	16
Paris green—		Peanut—	
analyses, Mich.....	438	bacterial disease, studies, N.C.....	1
analyses, N.J.....	639	cake, analyses.....	7
scald of tobacco plants by.....	351	cake, effect on milk and butter.....	10
<i>Parkinsonia microphylla</i> , transpira- tion in.....	728	cake, feeding value.....	7
Parthenocarp—		disease, notes.....	7
in fruits.....	226	leaf rust, treatment.....	7
in Nicotiana.....	136	leaf spot, studies, U.S.D.A.....	6
Parthenogenesis—		meal, analyses.....	56
in Nicotiana.....	136	meal, analyses, Mass.....	47
in plants.....	727	meal, analyses, N.J.....	62
in tomatoes.....	233	meal, analyses, Tex.....	87
Parturient apoplexy, paralysis, or paresis. (See Milk fever.)		tikka disease, notes.....	5
Paspalum poisoning in cattle, Miss.....	676	vines, ground, analyses.....	16
<i>Paspalum hecæa</i> , notes.....	442	Peanuts —	
Passion fruit brown spot, notes.....	614	composition and nutritive value.....	52
Pasteurization, résumé, N.Y.State.....	674	culture, Colo.....	62
Pasture mixtures, notes, Wash.....	95	culture and recipes, Ala.Taske- gee.....	69
Pavements, economy of types.....	484	insects affecting.....	51
Pea—		Pear—	
aphis, control by lady beetles, Va.Truck.....	555	blight, notes.....	351, 647, 648, 73
aphis, studies, U.S.D.A.....	62	blight, studies, Wash.....	42
forage, effect on milk and but- ter.....	570	blister disease, notes.....	52
hay, analyses, Wyo.....	469	diseases in New Jersey, N.J.....	16
straw, composition and digesti- bility.....	565	diseases in New South Wales.....	26
thrips, studies.....	450	fruit spots, notes.....	16
weevil, leaf-eating, biology.....	65	midge, notes.....	71
Peach—		Monilia blight, studies.....	10
borer, studies, N.J.....	161	psylla, notes.....	15
leaf curl, notes, N.J.....	144	psylla, notes, N.J.....	15
leaf curl, treatment, N.Y.Corn- nell.....	248	psylla, remedies, N.J.....	15
leaf glands, taxonomic value and structure, N.Y.Cornell.....	739	scab, notes.....	48
nursery stock die-back and gumming.....	646	sucker, notes.....	48
package law in New Jersey, N.J.....	639	thrips, notes.....	16
pollen, viability, N.J.....	144	Pears —	
scab, treatment, N.J.....	146	Bartlett, keeping qualities, N.Mex.....	79
scale, West Indian, control by parasites.....	456	blight resistant, from China.....	5
trees, injuries to by poultry, N.J.....	144	cider, propagation.....	62
Peaches—		culture.....	62
cost of precooling.....	637	parthenocarp in.....	25
cost of production.....	314, 739	pollination.....	203, 25
culture experiments, N.J.....	144	preserved, valuation.....	29
culture in Egypt.....	232	seedless, notes.....	26
June drop of, N.J.....	144	spraying experiments, N.J.....	16
packing and shipping, N.J.....	639	Peas—	
picking and handling.....	437, 739	analyses, Wyo.....	80
		as affected by pod position, N.J.....	72
		as an orchard cover crop, N.Mex.....	48
		canning, improvement in Wis- consin.....	26
		culture, Colo.....	62
		culture under irrigation, Colo.....	62
		effect on soil moisture.....	62
		fertilizer experiments.....	24, 518, 62

	Page.		Page.
<b>Peas</b> —Continued.		<b>Peptone</b> , effect on action of alcohol	
field, as a forage crop, U.S.D.A.	140	on plant cells	333
field, culture under dry farming,		<b>Peptones</b> —	
Idaho	734	in soils	325
field, rate of seedling test,		synthesis by means of enzymes	708
Idaho	734	<b>Perennials</b> , varieties for Illinois	45
field/ varieties, Idaho	735	<b>Peridermium</b> —	
field, varieties, Oreg.	228	<i>filamentosum</i> on yellow pine	
garden, varieties	833	seedlings, U.S.D.A.	649
growth as affected by alkali		<i>harknessii</i> and <i>Cronartium</i>	
salts, U.S.D.A.	125	<i>guercu</i> , association	849
rogues in	41	<i>pyriforme</i> and <i>Cronartium</i>	
water requirements, Wash.	720	<i>comandra</i> , identity	539
<b>Pest</b> —		<i>pyriforme</i> , new hosts, U.S.D.A.	354
analyses, Conn. State	521	<i>pyriforme</i> , notes, U.S.D.A.	242
and peat moors, utilization	618	<i>strobi</i> , studies	750
as a fertilizer or fertilizer filler	332	<b>Periodates</b> , determination	712
industry, notes	822	<b>Periodids</b> , organic, studies	502
lands or soils. (See Soils,		<b>Permeability</b> as affected by trivalent	
peat.)		and tetravalent cations	34
litter as a manure absorbent	517	<b>Peroid</b> , fungicidal value	847
litter, treatise	624	<i>Peronospora arborescens</i> , notes	50
machinery, tests	589	<b>Peronosporaceae</b> , perennial mycelium	
production in United States	332	in, U.S.D.A.	154
resources of Wisconsin	786	<b>Persimmons</b> , notes, U.S.D.A.	43
<b>Peasns</b> —		<i>Pestalozzia palmarum</i> , notes	56, 241, 442
culture, Ga.	151	<b>Petunias</b> —	
culture, U.S.D.A.	740	double seedling, notes	44
storage, Ga.	151	inheritance of doubleness in	237
top-working on hickory, Ga.	151	<b>Peyote</b> , narcotic, studies	326
varieties, Ga.	151	<i>Pezoporus (Schenkia) tenthredi-</i>	
vetins, use in food products	167	<i>narum</i> n.sp., description	456
<i>ceptorum</i> . (See Onion		<i>Phalaris bulbosa</i> , culture experi-	
maggot.)		ments	631
<b>Pharsonin</b> , studies	709	<i>Phaonia signata</i> , hibernation	254
<b>Pharsonium</b> —		<b>Phascolus</b> —	
canker, notes	56	<i>adenanthus</i> , culture, P.R.	736
scarlet, coloring matter of	709	<i>schierectus</i> , culture, P.R.	736
<b>Phlagra</b> —		<b>Pheasants</b> —	
cause	764	care and management	569
prevention	259, 764	crossbreeding experiments	564
relation to diet	258, 259, 764	<b>Phenacetin</b> , periodids of	502
review of investigations	463	<i>Phenacoccus acercola</i> , notes	752
veloris in flowers	823	<i>Phenodamus destrucns</i> , studies, Del.	156
<b>Penicillium</b> —		<b>Phenological</b> observations, import-	
<i>carpensum</i> on plums, U.S.D.A.	445	ance	536
<i>luteum purpuregenum</i> group	51	<b>Phenosperry</b> in Nicotiana	136
spp. on citrus	446	<i>Phlepsius</i> n.sp., description	255
<b>Pennsylvania</b> —		<b>Phlox</b> —	
College, notes	497	as a host of eelworm	349
Station, notes	497, 900	varieties	836
Station, report	197	<b>Phoma</b> —	
<b>Perlethron minutum</b> ( <i>Tricho-</i>		<i>betae</i> , notes	350
<i>gramma pretiosa</i> ), parasitic on		<i>betae</i> , studies, U.S.D.A.	156
bed moth	250	<i>brassicae</i> , notes	241
<b>Pentosan</b> in feeding stuffs, Tex.	168	<i>cajani</i> , notes	52
<b>Pentoses</b> , utilization by <i>Glomerella</i>		<i>citricarpa</i> , notes	644
<i>cingulata</i>	351	<i>mali</i> , notes	543, 646
<b>Peonin</b> , studies	710	<i>Phomopsis mali</i> , notes	247
<b>Peony</b> , coloring matter of	710	<b>Phonolite</b> potash, solubility	328
<b>Pepper</b> —		<b>Phorbia</b> —	
breeding experiments, N.J.	144	<i>ceptorum</i> . (See Onion mag-	
fruit disease, notes	442	got.)	
Peppermint, culture, U.S.D.A.	151	<i>muscaria</i> , hibernation	254
Peppin as a substitute for rennet	574		

	Page		Page
Phoridae, synonymic catalogue-----	651	Phosphorus--Continued.	
<i>Phormia regina</i> , notes-----	554	inorganic, determination, Ohio.	345
<i>Phorocera claripennis</i> , parasitic on		lipoid and acid-soluble, deter-	
army worm-----	251	mination in serum-----	612
Phosphatases in malt-----	502	nutrition of plants, notes-----	866
Phosphate--		Photometric analysis, review of in-	
Belgian, fertilizing value-----	518	vestigations-----	362
deposits in Florida-----	424, 521	Phototropism--	
deposits in Montana-----	329	as affected by temperature-----	625
deposits in Tennessee-----	724	studies-----	524
excretion as affected by water		<i>Phthorimæa operculella</i> . (See Po-	
drinking-----	763	tato-tuber worm.)	
in New Zealand-----	519	<i>Phylloperthia horticola</i> , notes-----	451
natural, fertilizing value-----	330	<i>Phyllosticta</i> --	
Norwegian, fertilizing value-----	518	<i>brassica</i> , <i>Mycosphaerella</i> stage--	8
of lime. (See Calcium phos-		<i>cajani</i> , notes-----	52
phate.)		<i>ramicola</i> , notes-----	561
Palmaer's, fertilizing value-----	330	<i>solitaria</i> , notes-----	215, 696
rock, action of sulphurous acid		sp., notes-----	247
on-----	220	sp., on rubber-----	744
rock, as affected by grinding,		<i>Phylloxera</i> --	
sifting, and roasting-----	220	spp., notes-----	453
rock, dissolved. (See Super-		<i>vastatrix</i> . (See Grape- <i>phyl-</i>	
phosphate.)		<i>loxera</i> .)	
rock, origin and preparation-----	724	Physiology--	
rock, use as a fertilizer, U.S.		International catalogue-----	655
D.A-----	328	treatise-----	111
Thomas, fertilizing value-----	431	<i>Physoderma</i> sp. on corn, S.C-----	641
Wolter's, fertilizing value-----	330	<i>Physokermes picea</i> , notes-----	72
Phosphates--		<i>Phytalus smithi</i> , parasites of-----	445
analyses-----	222	Phytin, determination-----	57
comparison-----	327, 330, 331, 518	<i>Phytomyza aquifolii</i> in New Jersey.	367
effect on milk production-----	670	Phytopathological culture supply	
effect on root development-----	518	laboratory, need of-----	529
for cranberries, N.J-----	150	Phytopathology and botany, rela-	
manufacture, U.S.D.A-----	329	tionship-----	4
methods of analysis-----	112	<i>Phytophthora</i> --	
soil, availability, Tex-----	421	<i>cactorum</i> studies, N.Y.Cornell--	746
solution by mineral acids-----	220	<i>faberi</i> , notes-----	349, 540, 744, 749
(See also Superphosphate.)		<i>infestans</i> . (See Potato late	
Phosphatic slag--		blight.)	
extraction with citric acid-----	331	<i>omnivora areca</i> , notes-----	55
fertilizing value-----	22,	<i>omnivora</i> as affected by cold.	
35, 298, 330, 518, 519		U.S.D.A-----	523
red coloration in-----	820	<i>omnivora</i> , notes-----	614
Phosphoric acid--		<i>parasitica</i> on coconuts-----	52
determination-----	314, 400, 805	sp. on castor beans-----	53
determination in calcium phos-		sp. on coconuts-----	55
phate-----	410	Pickle worm, studies, Ky-----	355
extraction from natural phos-		Picric acid, insecticidal and larvi-	
phates-----	329	cidal value-----	357
in starch-----	710	Pig--	
long continued use, Pa-----	128	disease, nature and treatment--	355
manufacture, U.S.D.A-----	329	diseases, notes, Mont-----	174
reverted, assimilation by plants.		diseases, treatise-----	257
Phosphorite, Kusan, fertilizing value.	330	farm, plans, Oreg-----	257
Phosphorites from Sengilef-----	329	houses, construction-----	659
Phosphorus--		houses, construction, Ky-----	659
determination-----	409, 805	Pigeon--	
determination in presence of		disease, studies-----	5
sulphuric acid-----	112	grass, analyses, N.Dak-----	52
determination in soil extracts-----	10	pen diseases, descriptions-----	756
determination in soils-----	806	peas, as a cover crop, P.R-----	855
diffusible, in cow's milk-----	271	Pigeons, <i>Hæmoproteus</i> infection in.	

	Page.		Page.
<b>hgments--</b>		<b>Pine--Continued.</b>	
anthocyan, investigations.....	223	moth, Zimmerman, studies, U.S.	
anthocyan, review of literature.....	335	D.A.....	159
of chromoleucites, studies.....	33	oil, insecticidal value.....	359
plant, production.....	223	rust, treatment.....	650
plant, review of investigations.....	33	sawfly, destructive, from Eu-	
<b>hgs--</b>		rope.....	363
ante-mortem inspection.....	280	seedlings, root rot of.....	546
as affected by cotton-seed meal,		shoot moth, European, in New	
N.C.....	79	Jersey.....	355
as affected by vegetable diet.....	400	shoot moth, European, notes.....	752
bacterial flora of buccal cavity.....	279	stands, succession by oak	
care and management, Ky.....	680	stands.....	537
cost of production, Oreg.....	374	weevil, notes, N.J.....	158
determination of race.....	769	wood, carbohydrates of.....	608
development of limbs.....	564	<b>Pineapples--</b>	
feeding experiments.....	74,	cover crops for, P.R.....	736
376, 468, 663, 769, 869		culture in Philippines.....	635
feeding experiments, Cal.....	265	<b>Pines--</b>	
feeding experiments, Idaho.....	767	diameter growth in.....	536
feeding experiments, Kans.....	685	evaporation from.....	537
feeding experiments, Ky.....	665, 666	fertilizer experiments.....	537
feeding experiments, Mo.....	769	height growth as affected by	
feeding experiments, N.J.....	172	weather.....	640
feeding experiments, N.Mex.....	768	longleaf yellow, utilization of	
feeding experiments, Ohio.....	567, 668	waste.....	839
feeding experiments, Oreg.....	265, 373	shortleaf, importance and man-	
feeding experiments, Tex.....	469	agement, U.S.D.A.....	346
feeding experiments, Wyo.....	469	western yellow, culture in Black	
following cotton-seed meal-fed		Hills.....	640
steers, Tex.....	866	western yellow, mill scale study	838
forage crops for, N.J.....	172	western yellow, volume tables.....	641
garbage tankage or "stick"		yellow, windfall damage.....	640
for, N.J.....	173	<i>Pinipexis zimmermani</i> , studies, U.S.	
inheritance of fertility in.....	400	D.A.....	159
internal parasites of, Ky.....	680	Pioneer irrigation district, Idaho,	
judging.....	94	drainage system for.....	483
malnutrition in, Ky.....	567	<b>Pipe--</b>	
mineral mixture for, N.J.....	173	lines, metal, construction.....	483
pigment specks in.....	766	wood-stave, repairing with con-	
profits and losses in.....	860	crete.....	890
raising in Montana, Mont.....	174	<i>Pipunculus</i> n.spp., descriptions.....	857
raising in North Dakota, N.		<i>Piroplasma annulatum</i> , notes.....	384
Dak.....	267	<b>Piroplasmosis--</b>	
raising on North Platte reclama-		canine, treatment.....	270
tion project, U.S.D.A.....	267	in European cattle.....	82, 478, 575
raising, treatise.....	268	parvum type, in cattle.....	383
rape pasture for, Ga.....	174	<i>Pissodes strobi</i> , notes, N.J.....	158
resistance to hog-cholera virus		Pistachio leaf spotting disease, notes	843
N.J.....	173	Pituitary substance--	
settling v. pasturing, Cal.....	265	effect on egg production.....	75, 668
use of food by.....	400	effect on growth.....	668, 765
Yorkshire, gestation period.....	373	effect on sexual development.....	765
<b>sweed--</b>		<b>Pituitrin--</b>	
eradication, Oreg.....	228	effect on milk secretion.....	270
rough, analyses, N.Dak.....	39	in fetal pituitary and supra-	
<b>sple--</b>		renal glands.....	675
( <i>Stiplectes</i> ) <i>conquisitor</i> , para-		<i>Pityophthorus</i> n.spp., descriptions.....	361
sicle on bud moth.....	250	<b>Plague--</b>	
spp. in Europe.....	657	dissemination by rats.....	548
<b>ne--</b>		relation to rodents.....	355
blister rust, control in Ver-		<b>Plant--</b>	
mont.....	837	breeding experiments in Canada	40
blister rust, studies.....	750	breeding experiments in Dahlem	727
blister rust threatening Pacific		cell membranes, chemistry and	
Status.....	354	structure.....	626
leaf scale, notes.....	752		

Plant--Continued.	Page.	Plant--Continued.	Page.
cell substances, electric charge.	525	pathology, treatise.	70
cells, intake of material by.	333	pigments, production.	6
cells, protoplasm of.	33	pigments, review of investigations.	82, 83
cells, reduction and oxidation regions in.	33	roots, exosmosis from.	73
cells, rôle in ascent of sap.	727	tissue, permeability.	71
chlorosis, notes.	720	Plants--	
cultures, nutrient solutions for.	333	acridity in.	70
disease survey, N.C.	49	allimentary and medicinal.	70
disease survey, Pa.	154	treatise.	70
diseases--		as affected by aluminum.	70
at Salgir Experiment Station.	842	as affected by ethylene.	70
bacterial, notes.	49	as affected by soot, Pa.	70
bibliography, Ill.	348	bud sports in.	70
classification and terminology.	642	carotinoids in.	70
in Astrakhan.	842	climbing, treatise.	70
in Barbados.	841	desert, transpiration in.	70
in British Guiana.	442	dwarf, origin.	70
in California, Cal.	240	economic, at Agronomic Experiment Station, Santiago de las Vegas, Cuba.	70
in Colorado, Colo.	539	economic, at Botanic Garden in British Guiana.	70
in Dahlem.	727	evolution of.	70
in Dutch East Indies.	744	exercises with for rural schools, U.S.D.A.	70
in Grenada.	841	formation of starch in.	70
in Indiana, Ind.	744	freezing and frost killing.	70
in Italy.	539	growth, abnormal forms, N.J.	70
in Mauritius.	843	growth as affected by boron.	70
in New Jersey, N.J.	153	growth as affected by boron, U.S.D.A.	70
in New South Wales.	614	growth as affected by light.	70
in Province of Podolsk.	843	growth as affected by radium.	70
in Pusa.	49	growth in distilled water and dilute toxic solutions.	70
in the Tropics.	48	growth in relation to atmospheric pollution.	70
in Trinidad and Tobago.	50	growth, periodicity in.	70
in Uganda.	540	growth, treatise.	70
in Union of South Africa.	241	house and window, treatise.	70
international control.	442, 840	house, culture.	70
notes, S.C.	643	imports, U.S.D.A.	70
relation to meteorology.	840	improvement through bud selection.	70
studies.	743	industrial, conservation.	70
text-book.	794	medicinal, as affected by composition of soils.	70
treatment, N.Y.Cornell.	40	medicinal, culture.	70
treatment, Ohio.	642	medicinal, culture experiments.	70
treatment, development in.	48	medicinal, fertilizer experiments.	70
treatment with hot water.	50	medicinal, of Wisconsin.	70
(See also different host plants.)		monocious, evolution.	70
enzymes, studies.	428, 731	new or noteworthy, from Colombia and Central America.	70
food accessories, bacterial test for.	325	nitrification in.	70
histology, treatise.	727	of lower California.	70
inspection. (See Nursery inspection.)		ornamental, culture experiments, U.S.D.A.	70
introduction in North and South America.	306	ornamental, culture in Mexico.	70
lice in Hawaii.	59	ornamental, description, Ill.	70
lice in Ohio, Ohio.	59	ornamental, for Florida.	70
lice, notes, N.J.	153	ornamental, for home grounds, N.Y.Cornell.	70
(See also Apple aphids, etc.)			
nutrition, physiology of.	326		
nutrition, treatise.	135		
oxidases, distribution.	32		
parasites and their hosts, relationship.	49		
parasitism, physiology of.	847		
pathology, society of in France.	849		

ants--Continued.	Page.	Flows--	Page.
ornamental, for latitude of St. Louis.....	493	draft of, Pa.....	125
ornamental, insects affecting.....	651	motor, tests.....	656, 788, 801
ornamental, native to United States.....	535	Plum--	
ornamental, nematodes affecting.....	249	brown rot, notes.....	241
ornamental, sports of.....	639	silver leaf disease, studies.....	648
ornamental, varieties, U.S.D.A.....	231	wilt, studies, Ga.....	747
oxidative changes in.....	731	Plumbing for country houses.....	286
parthenogenesis in.....	727	Plums--	
Philippine, propagation by cuttings and layerage.....	436	Cytospora disease of.....	648
physiology of heredity in.....	822	improvement in Minnesota.....	637
poisonous, of Colorado, Colo.....	576	picking and handling.....	437
poisonous, of Union of South Africa.....	241	pollination.....	233, 341
preparation and mounting.....	94	varieties resistant to brown rot, U.S.D.A.....	444
propagation by cuttings, Wash.....	694	wild goose, changes in during ripening.....	802
resistance to hot water.....	843	<i>Platella maculipennis</i> , (See Diamond-back moth.)	
respiration investigations.....	523, 524	Pneumonia, equine, (See Influenza, equine.)	
sexual development in relation to nutrition.....	824	<i>Pneumovirus fort</i> n.s.p., description.....	364
sexual reproduction in.....	526	<i>Podisma frigida</i> in Alaska.....	61
smoke injury to.....	744	<i>Podophyllum emodi</i> , culture.....	346
succulent, desiccation and starvation experiments.....	430	<i>Podophora</i> spp., notes.....	247
transferring power, studies.....	334, 728	<i>Podosporiella verticillata</i> n.s.p., description.....	644
utilization of sulphur by.....	331	Poisons--	
variations in.....	635	detection in water.....	419
velocity of transmission of excitation in.....	29	organic, effect on plant cells.....	526
water requirements.....	521, 522	Polariscope, sodium lamp for.....	804
wilting.....	728	Political economy instruction in agricultural schools.....	693
wilting, drying and resurgence.....	825	Poll evil, immunization.....	580
woody, bibliography.....	435	Pollen, formation.....	525
woody of Oahu lowlands.....	345	<i>Pollenia rudis</i> , hibernation.....	234
woody, phloem and bark diseases of.....	442	Pollination, physiology of.....	628
<i>Xemodophora brassica</i> , (See Cabbage club root.)		<i>Polychrostis bohrana</i> --	
<i>Xasopara citricola</i> --		biology and remedies.....	654
studies.....	352, 544	monograph.....	553
studies, Wis.....	246	remedies.....	63
treatment.....	748, 842	Polymorphism in fungi.....	32
aster, land, (See Gypsum.)		Polypeptides, synthesis by means of enzymes.....	708
II experiments, elimination of error in, Mich.....	735	<i>Polyporus rayoparius</i> , studies.....	547
atinum, scrap, conversion into chloroplatinic acid.....	804	Polysulphids, insecticidal value.....	61
<i>Hypera pasciophora</i> , notes.....	851	Pomace by attacking blueberries, Mo.....	852
<i>Hypera fuscicornis</i> , growth and peridium formation, U.S.D.A.....	647	Pomegranate disease, notes, U.S.D.A.....	232
<i>Homopus</i> sp. on apples, Mich.....	744	Pomelos--	
<i>Ospera lepedeza</i> n.s.p., description.....	242	bright v. russet fruit of.....	535
clostrids, erection.....	356	composition and culture.....	835
antrax, contagious, (See influenza, equine.)		total solids and acidity, N.Dak.....	661
king, deep c. ordinary, Pa.....	124	<i>Pomphopora sayi</i> , notes.....	752
<i>Orithia morbosus</i> as affected by id, U.S.D.A.....	538	Pond lily aphid as a plum pest.....	550
		Pop corn--	
		breeding experiments, N.J.....	144
		rice, studies, Conn.State.....	431
		viability tests, N.J.....	145
		Poplar borer, remedies.....	656
		Poppies, fertilizer experiments.....	820
		Poppy-seed cake, effect on milk and butter.....	570
		Population, Malthusian theory, treatise.....	594

	Page.	Potato—Continued.	Page
<i>Populus vancouveriana</i> n.sp., description.....	338	black heart, investigations.....	34
Pork fat, digestion and absorption.....	257	blight, infection experiments.....	2
<i>Parasagrotis orthogonia</i> , poisoned bait for.....	358	blight, treatment with hot water.....	3
Porricoudylariae of New York.....	752	canker, treatment.....	37
<i>Parithetria dispar</i> . (See Gipsy moth.).....		corky scab, notes.....	37
Posts, preservation, Iowa.....	153	curly leaf, studies.....	37
Potash—		diet, effects of.....	37
brines, evaporation.....	425	diseases, investigations.....	37
deposits in Texas.....	26	diseases, notes, Mich.....	37
fertilizer experiments, review.....	821	diseases, notes, Ohio.....	37
fertilizing value, S.C.....	519	flea-beetle, notes, N.J.....	37
fixation by soil bacteria.....	815	flea-beetle, remedies.....	37
for cranberries, N.J.....	150	flour, use in baking.....	37
for roses, N.J.....	143	foliage, composition and feeding value.....	503, 504
from copper and gold ores.....	425	late blight fungus, germination and infection, Wis.....	38
from feldspatic rock.....	27	late blight, hibernation of fungus, U.S.D.A.....	37
from seaweed.....	28	late blight, notes.....	50, 51
from wood and plant ashes.....	425	leaf roll diseases, notes.....	44
in soils, liberation, S.C.....	519	moth, remedies.....	64
lakes and deposits as a source of potash.....	327	pink and green aphid, studies, Me.....	32, 33
long-continued use, Pa.....	128	planters, tests.....	68, 69
of silicates, solubility.....	328	poisoning, studies.....	19
salts, fertilizing value.....	519	powdery scab, native habitat.....	64
salts for meadow soils.....	22	powdery scab, treatment.....	15
salts, replacing with sodium chloride.....	726	refuse, effect on milk.....	47
(See also Potassium salts.)		Rhizoctonia disease, studies.....	37
sources of.....	327	rot, notes.....	37
sources of, S.C.....	519	scab, treatment, Ind.....	37
sources of in America.....	821	scab, treatment, N.J.....	37
substitutes for.....	327	starch, baking tests.....	40
supply, Ohio.....	494	tuber rots, studies, U.S.D.A.....	37
use in agriculture.....	27	tuber worm, notes.....	250, 251
waste liquor lime, fertilizing value.....	26	tuber worm remedies.....	64
works waste products, fertilizing value.....	328	wart disease, studies.....	34
world's supply.....	724	Potatoes—	
Potassium—		amylolastic activity.....	65
acid phthalate in acidimetry and alkalimetry.....	408	breeding experiments, S.C.....	69
adsorption by soils.....	817	culture.....	38
chlorid for cranberries, N.J.....	150	culture, N.Y.State.....	38
cyanid, effect on permeability of vegetable plasma membrane.....	333	culture, Wyo.....	61
determination.....	503	culture contests.....	68
ferrocyanid, fertilizing value.....	27	culture experiments, U.S.D.A.....	25, 26
permanganate treatment for seed grains.....	844	culture in Georgia.....	65
salts, effect on germination and growth of crops, U.S.D.A.....	125	culture under irrigation, Colo.....	55
(See also Potash salts.)		effect on composition of following wheat crop.....	20
sulphur mixture, insecticidal value, U.S.D.A.....	60	effect on soil moisture.....	37
Potato—		factors affecting health, Colo.....	37
aphis, control by lady beetles, Va.Truck.....	555	fertilizer experiments.....	3
beetle, Colorado, life history, U.S.D.A.....	756	518, 519, 621.....	29
beetle, Colorado, notes, Wash.....	753	fertilizer experiments, Mass.....	37
beetle, Colorado, oviposition.....	655	fertilizer experiments, Mich.....	37
		irrigation experiments, U.S.D.A.....	37
		irrigation experiments, Wash.....	37
		loss in boiling.....	37
		marketing, Wis.....	37
		marketing cooperatively.....	37
		respiration investigations, Md.....	37
		seed, certification in Germany.....	37

Subjects—Continued.	Page.	Subjects—Continued.	Page.
seed selection.....	338	Pregnancy, diagnosis.....	80, 81, 565, 577, 780
seed selection, Wash.....	494	<i>Preptoceras mayfieldi</i> n.sp., descrip- tion.....	264
seed, sprouting before planting.....	530	Prickly pear, ( <i>See</i> Cactus.).....	
spraying, and dusting experi- ments, N.J.....	158	<i>Primula</i> —	
thinning experiments, Mont.....	736	<i>acutis</i> , inheritance of hetero- stylism in.....	226
translocation of mineral con- stituents, U.S.D.A.....	427	<i>sinensis</i> , flower pattern in.....	731
varieties, Idaho.....	734	<i>sinensis</i> , heredity in.....	822
varieties, Mass.....	231	<i>sinensis</i> , variegation in.....	226
yields in relation to rainfall.....	319	Privies, sanitary, description.....	88
oultry—		<i>Prociophitus</i> —	
appliances, description, Cal.....	377	<i>bumelia</i> , notes.....	357
breeding experiments, N.J.....	177	<i>fraxini-dipetale</i> , notes.....	356, 453
breeding, review of investiga- tions.....	268	<i>pyri</i> , notes, U.S.D.A.....	854
care and management.....	377, 770	<i>Proctophylodes trietocous</i> n.sp., de- scription.....	66
care and management, Colo.....	569	<i>Profenusa colaris</i> , investigations, U.S.D.A.....	456
care and management, Me.....	569	<i>Pronusca</i> , erection.....	253
care and management, W.Va.....	669	<i>Prosmoridea elongatus</i> n.g. and n.sp., description.....	363
diseases, nature and treatment.....	383	<i>Prosoptis spicijera</i> , in Punjab.....	46
diseases, treatise.....	280, 481, 881	<i>Prospaltella berlesci</i> , parasitic on mulberry scale.....	456
experiments, N.J.....	176	Proteases, serum, studies.....	674
external parasites.....	470	Protel. ( <i>See</i> Protein.).....	
farms, small, developing, Wash.....	294	Protein—	
fattening for market, Pa.....	178	as affected by bromin.....	803
feeding, Mo.....	377	cleavage products. ( <i>See</i> Amino acids.).....	
feeding experiments.....	664	derivatives, physiological action.....	71
feeding experiments, Ind.....	376	extraction from wheat flour.....	610
houses, construction.....	192, 590, 780	formation, treatise.....	708
houses, construction, Mo.....	391	free amino groups in.....	501
houses, description, N.J.....	177	Hopkins-Cole reaction for.....	713
injuries to peach trees, N.J.....	144	isolated, value in the diet.....	368
instruction, home projects in.....	365	metabolic relation to glucose.....	366
instruction in Ireland.....	196	metabolism as affected by car- bohydrate and fat.....	762
manure, use, Ohio.....	494	methods of analysis.....	505
notes, Wash.....	194	milk, preparation.....	461
production, illustrated lecture, U.S.D.A.....	196	mixtures, inhibitory action on anaphylaxis.....	578
raising in Wisconsin, Wis.....	813	of wheat flour, chemical consti- tution.....	803
rations, computing.....	377	requirement of infants.....	68
selection experiments.....	74, 564, 570	storage, relation to acidosis, Wis.....	261
sprouted grain for, Wash.....	294	synthesis by means of enzymes.....	708
statistics in Ireland.....	291	vegetable, biological reactions.....	577
survey of a country village in New York.....	669	vegetable, investigations.....	762
treatise.....	269, 377, 470	Proteoses in soils.....	325
water management, Wash.....	770	<i>Protocalliphora azurea</i> , studies.....	350
( <i>See also</i> Chickens, Ducks, etc.).....		Protoplasm—	
<i>Spodopis vitatus</i> , notes.....	753	electric charge of.....	525
airie—		of plant cells.....	33
berry, crossing with <i>Solanum</i> nigrum, N.J.....	146	Protozoa of soils—	
dogs, control, Nebr.....	57	activity, U.S.D.A.....	422
reipitation—		counting.....	513
atmospheric, electricity of, U.S. D.A.....	413	investigations, U.S.D.A.....	20
in British Columbia.....	320	relation to soil bacteria.....	326
reactions, equilibrium in.....	779	separation, U.S.D.A.....	217
( <i>See also</i> Rainfall, Snowfall, etc.).....			
scipith—			
and sensitizin, relationship.....	778		
reaction, notes.....	579		

	Page.	Pullets—	Page.
Provender—		cost of raising—	369
analyses, Mass.-----	467	early-hatched, for egg produc-	
analyses, N.H.-----	169	tion-----	371
analyses, Vt.-----	371	early-hatched for egg produc-	
Prune—		tion, Wash-----	96
blight, notes-----	648	feeding experiments, Idaho-----	79
Monilia blight, studies-----	351	feeding experiments, Ind.-----	376
rust in southern California-----	352	late fall hatched, for egg pro-	
Prunes—		duction, N.J.-----	175
dried, microbiology-----	460	management, Wash-----	694, 754
handling and shipping, U.S.		Pulpwood industry in Canada-----	48
D.A.-----	534	Pulse grains, effect on milk and but-	
Pruning, notes-----	833	ter-----	370
<i>Prunus domestica</i> , silver leaf dis-		Pumping, drainage, cost of-----	583
ease of-----	648	Pumps—	
Prussic acid. (See Hydrocyanic		centrifugal, priming-----	8
acid.)		centrifugal, treatise-----	482
<i>Pseudanthrenus validus</i> , studies,		for irrigation-----	48
Mo-----	852	use in drainage, U.S.D.A.-----	285
<i>Pseudhomalopoda prima</i> n.g. and		Purchasing associations in Posen	
n.sp., description-----	857	and West Prussia-----	896
<i>Pseudanthrax bacilli</i> , biology and		Purdue University, notes-----	495
diagnosis-----	781	Purin bases, determination in urine	
<i>Pseudobranchistha semiaurea</i> n.g.		and blood-----	411
and n.sp., description-----	363	Purple scale, notes-----	66
<i>Pseudococcus</i> —		Pus cells. (See Leucocytes.)	
<i>citri</i> . (See Citrus mealy bug.)		Putrefaction of meat, game, and	
sp. from Japan in New Jersey-----	355	fish-----	161
sp. on citrus fruits-----	62	Pyralidae of Bermuda-----	61
sp. on sugar cane-----	753	<i>Pyrellia eriophthalma</i> , hibernation-----	24
sp. in Ohio, Ohio-----	50	<i>Pyrenochata elodea</i> n.sp., descrip-	
ssp., studies, Cal.-----	162	tion-----	946
<i>Pseudomonas</i> —		Pyrethrums, varieties-----	838
<i>campestris</i> , notes-----	644	Pyridin vapor, larvicidal value-----	259
<i>citri</i> , investigations, Fla.-----	447	Pyrogallie acid, effect on action of	
<i>juglandis</i> , studies-----	545	soil organic compounds, Tex-----	127
<i>phaseoli</i> , studies, Mich.-----	746	Pyrox, insecticidal value, N.J.-----	142
<i>Pseudomphale</i> n.sp., description-----	66	Pythiaceous—	
<i>Pseudorhysa sternata</i> n.g. and		<i>citrophthora</i> , description-----	333
n.sp., description-----	758	sp. on deciduous nursery	
Pseudotuberculosis, notes-----	184	stock-----	353, 648
<i>Psychoda cinerea</i> , life history-----	651	<i>Pythium palmivorum</i> , notes-----	841
Psylla—		Quack grass, eradication, Minn.-----	239
malt, studies-----	451	Quail, California valley, destruction	
<i>pyri</i> ( <i>pyricola</i> ) (See Pear		with poisoned barley-----	530
psylla.)-----	253	Quassia, insecticidal value-----	553
Psylla, remedies-----		<i>Quercus</i> n.spp. of lower California-----	57
<i>Pteridium aquilinum</i> , chemistry and		Quince—	
anatomy of-----	522	blight, notes-----	69
Public health legislation in United		diseases, treatment with bot	
States, manual-----	661	water-----	5
Puccinia—		Japanese, fruit of-----	25
<i>arenaria</i> , biology-----	242	Quinin—	
<i>glumarum</i> , notes-----	843	hydrochlorid as an antiseptic-----	83
<i>glumarum</i> , studies-----	349	hydrochlorid, toxicity toward	
<i>graminis</i> , notes-----	242, 845	plants-----	28
<i>malvacearum</i> , germination of		use against gaseous gangrene-----	28
teleutospores-----	744	Quinolin, insecticidal and larvicidal	
<i>oryza</i> , studies-----	745	value-----	556
<i>phlebotensis</i> , infection experi-		Quinone—	
ments, U.S.D.A.-----	244	effect on plant growth, Tex-----	128
<i>pruni-spinosa</i> , notes-----	352	effect on wheat plants-----	25
spp., teleutospore formation-----	745	Rabbit injuries to apple trees, pre-	
<i>triticea</i> , notes-----	845	vention-----	28
Puerperal diseases in cattle and			
their relation to meat poisoning--	386		

	Page.		Page.
Rabbits—		Rape—	
cottontail, damage from, U.S.		cake, effect on milk and butter..	570
D.A. ....	751	for pigs, Ga. ....	174
cross-breeding experiments. ....	370, 466	seed cake, analyses. ....	263
inheritance in. ....	864	seed production and utilization..	531
lacemization, studies. ....	71	susceptibility to swede mildew..	52
radio-active—		tops, analyses and feeding value..	664
deposit from atmosphere, U.S.		yield as affected by sulphur. ....	726
D.A. ....	615	<i>Rapistrum rugosum</i> , notes. ....	532
ores and residues, fertilizing		Raspberries—	
value. ....	821, 822	culture, N.Y.State. ....	42
Radio activity of spring water. ....	332	fertilizer experiments, Mass. ....	294
Radishes—		improvement in Minnesota. ....	637
assimilation of mineral salts		propagation and shipping expe-	
by. ....	135	riments. ....	637
Chinese, distribution of starch		Raspberry—	
in. ....	41	juice, studies. ....	256
fertilizer experiments. ....	520, 821	mildew, notes. ....	749
fertilizer experiments, Ill. ....	532	whit, description. ....	55
historical study. ....	532	Rations—	
Japanese, culture. ....	41	effect on growth and dairy	
utilization of free nitrogen by. ....	218	qualities of cows, Mo. ....	378
Radium—		for cattle feeding. ....	72
effect on germination of seed. ....	626, 730	mixed, digestibility, Ga. ....	169
effect on plant growth. ....	223	Rats—	
fertilizing value. ....	31, 331	as affected by gonadectomy. ....	263
in water from Gulf of Mexico,		migratory habits. ....	518
U.S.D.A. ....	118	of Great Britain. ....	57
Raffinose, determination. ....	313	rice, new species of. ....	850
Ragweed, great, analyses, N.Dak. ....	39	<i>Razoumofskya</i> —	
Railway ties, preservation. ....	240	<i>laricis</i> injurious to larch, U.S.	
Rain—		D.A. ....	547
composition. ....	15	<i>taugensis</i> in Alaska. ....	546
sage exposure, effect, U.S.D.A. ....	117	Red—	
nitric and nitrous acids in,		bugs, notes, Pa. ....	160
U.S.D.A. ....	118	clover. ( <i>See</i> Clover, red.)	
nitrogen, chlorine, and sulphates		dog flour. ( <i>See</i> Flour, red	
in. ....	615	dog.)	
Rainfall—		spider. ( <i>See</i> Spider, red.)	
at Montevideo. ....	15	Redtop, palatability, Ohio. ....	805
effect on composition of toma-		Redwater, Rhodesian. ( <i>See</i> African	
toes. ....	636	coast fever.)	
effect on crop yields. ....	319	Reforestation—	
effect on water level in wells. ....	319	and occult condensation, U.S.	
in Australia, U.S.D.A. ....	118	D.A. ....	614
in Scotland. ....	320	of brush fields of northern Cali-	
in Sumatra. ....	510	fornia. ....	640
in Union of South Africa. ....	818	Refrigeration, notes. ....	862
in United States. ....	415	<i>Rehmiella ulmicola</i> n.sp., descrip-	
in western Africa. ....	208	tion. ....	242
in western and equatorial		Rennet—	
Africa. ....	320	for cheese making. ....	77
observations, long-period, value.		preparation from calves'	
observers, instructions to,		stomachs. ....	574
U.S.D.A. ....	500	substitutes for. ....	574
relation to battles. ....	509	Resin yielding plants, treatise. ....	838
relation to water supply.		Resins in hops. ....	502, 711
( <i>See also</i> Precipitation.)		Respiration—	
Public Industry in United States,		apparatus, types of. ....	260
U.S.D.A. ....	835	calorimeter for study of dis-	
Raisins—		ease. ....	67
insects affecting, Cal. ....	60	calorimeter, improved, U.S.D.A. ....	369
making, Cal. ....	235	experiments with men. ....	290
		experiments with newborn in-	
		fants. ....	861
		experiments with sweet pota-	
		toes, U.S.D.A. ....	426

Respiratory—	Page.	Rice—Continued.	Page.
activity, relation to sunlight...	30	dietary deficiencies, nature of...	567
chamber for small animals...	370	diseases, notes...	39, 44
exchange. (See Gaseous ex-		grading, U.S.D.A. ....	566
change.)		hulls, analyses, Tex. ....	467
Restaurants, inspection in Indiana...	861	imports into United States,	
<i>Rhabdoblatta brunneonigra</i> n.sp.,		U.S.D.A. ....	435
from China .....	255	inflorescence of .....	341
<i>Rhabdocnemis</i> sp. affecting sugar		insects affecting .....	652
cane .....	556	irrigation, Tex. ....	281
<i>Rhagoletis</i> —		meal, analyses .....	293
<i>juniperinus</i> n.sp., description...	450	meal, effect on milk and butter...	570
<i>pomonella</i> . (See Apple mag-		milling, U.S.D.A. ....	558
got.)		moth, notes .....	754
Rhamnose, determination in pres-		polish, analyses .....	293
ence of other methylpentoses...	11	polish, analyses, Ind. ....	282
Rhaphidophorinae in America north		polish, analyses, Tex. ....	467
of Mexico .....	854	polishings extract, use against	
<i>Rhipicephalus simulans</i> , notes .....	851	berl-berl .....	387
Rhizoctonia, investigations .....	840	straw, digestibility .....	72
<i>Rhizoctonia</i> —		transplanting, Italian method...	35
<i>solani</i> , rejection of name .....	443	use in bread making .....	460
spp. in India .....	50	varieties .....	56
spp. on potatoes .....	350	weevil, notes .....	754
<i>Rhizopus</i> —		wild, ergot of .....	444
<i>nigrivans</i> on tomatoes .....	53	worm, notes .....	250
<i>nigrivans</i> , studies, Del. ....	156	Ricin, detection in feeding stuffs...	467
spp., physiological studies .....	559	Ricinus poisoning, studies .....	496
Rhode Island Station, notes .....	206, 900	<i>Ripersia theae</i> n.sp., notes .....	652
Rhodes grass, culture, S.C. ....	694	<i>Riptortus</i> spp., affecting tea .....	652
Rhodesian redwater. (See African		River—	
coast fever.)		gaze stations in United States,	
Rhododendron lace bug, studies .....	451	U.S.D.A. ....	84
<i>Rhopalomyia hypogaea</i> , notes .....	251	measurement. (See Stream	
<i>Rhopalosiphum</i> —		measurement.)	
<i>hippocæs</i> and <i>Myzus draggii</i> ,		observers, instructions to, U.S.	
confusion .....	357	D.A. ....	500
<i>nymphææ</i> affecting plums .....	550	regulation, treatise .....	885
Rhubarb—		Road—	
composition .....	255	bonds, U.S.D.A. ....	196
culture, N.Y.State .....	41	building rock, tests, U.S.D.A. ....	684, 694
culture, treatise .....	232	drugs, construction and use .....	684
fertilizer experiments, Mass. .	294	laws in United States .....	330
handling and shipping .....	637	laws in West Virginia .....	684
<i>Rhynchites</i> —		machinery, cost of operation .....	481
<i>auratus</i> , life history .....	361	materials, bituminous, methods	
spp. in Russia .....	857	of examination, U.S.D.A. ....	318
Rhynchophorous larvæ secretions in		materials in Minnesota .....	483
cocoa making .....	362	materials in Wisconsin .....	82
Rhyssa, studies .....	758	surveying in Queensland .....	899
<i>Rhytisma punctatum</i> , notes .....	843	Roads—	
Rice—		administration in Iowa .....	683
analyses, U.S.D.A. ....	560	administration in Kansas .....	768
artificial cross-pollination .....	823	administration in Massachu-	
as affected by acids and alkalis		setts .....	587
and their salts .....	31	administration in New Jersey...	896
beer ferment, Indian, analyses...	711	administration in Ontario .....	684
bran, analyses .....	566, 767	administration in Oregon .....	287
bran, analyses, Tex. ....	467	administration in Pennsylvania...	296
chop, analyses, Tex. ....	467	administration, papers on .....	596
composition at various stages of		brick monolithic, construction...	484
growth, U.S.D.A. ....	435	concrete and brick, mainte-	
culture, dapog method .....	631	nance .....	787
culture experiments .....	231	concrete, hydrated lime for .....	787
culture in Burma .....	227	concrete, measuring wear of,	
culture in Vercelli .....	435	U.S.D.A. ....	787

# INDEX OF SUBJECTS.

989

Roads--Continued.	Page.	Rose--Continued.	Page.
concrete, resistance to wear.....	484	mildew, treatment with hot	
concrete, specifications.....	685	water.....	50
construction.....	890	thrips, remedies, N.J.....	161
construction and maintenance.....	287	tree crown gall, notes.....	442
earth and sand-clay, construc- tion.....	684	<i>Rosellinia</i> --	
economy of various types.....	484	<i>bonodes</i> on hibiscus.....	841
grading and improvement, in- formation for bidders.....	685	<i>neovatrix</i> on apple and goose- berry.....	49
improvement, economic factors in.....	788	<i>pepo</i> or <i>R. bonodes</i> on limes.....	545
mileage and expenditures, U.S. D.A.....	190	spp. on cacao.....	841
prison labor for.....	684	Roses--	
reconstructing in Southern States.....	484	coloring matter of.....	709
refined tars for.....	684	culture, Can.....	439
state management.....	788	culture experiments, N.J.....	44
superlevation of curves.....	86	fertilizer experiments, N.J.....	45, 143
Roaring in horses, treatment.....	576	hardy yellow, from China.....	45
Rock, road-building, tests, U.S. D.A.....	684, 890	petalody of sepal in, N.J.....	143
Rockfalls, treatise.....	45	rate of growth, N.J.....	143
Rocks of United States, analyses.....	222	soils for, N.J.....	144
Rodent--		testing garden at Arlington Ex- perimental Farm.....	345
disease, transmissible to man-- plague, relation to human infec- tion.....	355	testing garden at Cornell Uni- versity.....	345
Rodents--		treatise.....	45
control in Colorado.....	651	Rosewood of southern India, notes.....	240
notes, Colo.....	528	Rosin, extraction from wood.....	412
Röntgen rays, effect on seeds of <i>Vicia faba</i> .....	334	Rotation--	
Root--		experiments, Mich.....	723
crops, culture, Wyo.....	630	of crops, Vt.....	337
crops, culture in Philippines.....	635	Rotifers, sex control in.....	766
crops, culture in South Aus- tralia.....	341	Roup, secondary invader.....	481
crops, culture in Sweden.....	431	Royal--	
crops, dry matter content.....	865	Agricultural, Horticultural, and Forestry High School at Wag- eningen, Netherlands.....	898
crops, insects affecting.....	651	Botanic Gardens in Perade- niya, history.....	741
growth, periodicity in.....	29	Rubber--	
knot, treatment, Mich.....	245	Castilla, tapping experiments.....	438
maggots, notes, Wash.....	753	Ceara, culture experiments.....	152
systems of plants, development.....	727	culture and industry, papers on.....	838
tubercles, formation, Mich.....	727	culture in Dominica.....	438
Roots--		culture, use of dynamite in.....	47
absorption of ions by.....	334	diseases, notes.....	57, 442, 540, 849
aeration experiments.....	334	fertilizer experiments.....	48, 838
as affected by illuminating gas.....	243	green manure crops for.....	344
hydrotropism in.....	223	Hevea, ( <i>See</i> Rubber, Para.)	
<i>Rosa hugonis</i> , description.....	45	Insects affecting.....	632, 851
Rose--		Para, culture in Trinidad.....	47
beetle, Japanese, in Hawaii.....	59	Para, food storage and rest pe- riod in.....	240
black spot, treatment, N.J.....	157	Para, reproduction in.....	639
buds, malformation, N.J.....	143	Para, tapping experiments.....	47, 346, 537
chafer, notes, N.J.....	158	pink disease, studies.....	448
chafer, poisonous effect on chickens.....	655	plants of Italian Somaliland.....	152
leaf diseases, treatment, N.Y. Cornell.....	747	tapping experiments.....	47
leaf mildew, treatment.....	442	yielding plants, treatise.....	938
mildew, treatment.....	750	Ruminant, fossil, from Rock Creek, Texas.....	264
mildew, treatment, N.J.....	157	Rural--	
		communities, organization in Kansas.....	689
		credit. ( <i>See</i> Agricultural credit.)	

Rural—Continued.	Page.	Rye—Continued.	Page.
education, improvement .....	897	varieties, Ga. ....	138
education, treatise .....	292	varieties, U.S.D.A. ....	738
housing, treatise .....	895	wheat hybrids, natural. ....	229
migration in United States .....	198	yield in relation to meteor.	
organization in Ohio .....	895	ology .....	207, 319, 715
organization in Tennessee .....	895	Saccharin—	
progress, conference on .....	899	toxicity .....	493
sanitation, notes, Wash. ....	790	use in foods, N.Dak. ....	374
schools. (See Schools, rural.)		Saccharose, determination in frozen	
sociology, treatise .....	790	beets .....	11
Rust—		Sainfoin, effect on milk and butter.	579
mitte, notes .....	60	<i>Saissetia hemisphaerica</i> . (See Hem	
yellow, overwintering .....	51	ispherical scale.)	
Rusts of North America with		Sal, natural reproduction .....	347, 433
craoma-like sorl .....	539	Salicylic aldehyde—	
(See also Grain, Wheat, etc.)		antizymotic action .....	613
Ruta-bagas. (See Swedes.)		effect on plant growth .....	20, 328
Rye—		Saltvay digestion, relation to	
as a cover crop for cherry or-		gastric digestion .....	802
chards, Oreg. ....	231	Salmon waste, analyses .....	9
bran, analyses, Ind. ....	263	Salt—	
bran, analyses, N.J. ....	685	determination in sea water .....	369
bread, composition and nutritive		effect on butter flora, Mich. ....	776
value .....	760	effect on invertase .....	496
composition as affected by fer-		fertilizing value .....	519, 529
tilization and soil preparation ..	230	Salt-peter—	
cost of production, N.J. ....	137	as a source of potash .....	327
crossing experiments, Oreg. ....	228	Chile. (See Sodium nitrate.)	
culture, S.C. ....	694	use in cheese making .....	574
culture, continuous, N.J. ....	138	Salts—	
culture experiments, Ga. ....	138	absorption and secretion by	
culture experiments, S.Dak. ....	230	roots .....	24
culture experiments, U.S.D.A. ....	137	absorption by cultivated soils ..	24
culture on sandy soil .....	37	absorption by living and dead	
culture under irrigation, Colo. ....	528	roots .....	394
effect on baking quality of		and acids, antagonism between ..	49
wheat, U.S.D.A. ....	558	antagonism, U.S.D.A. ....	128
effect on milk and butter .....	570	antagonism, additive effects .....	79
effect on soil moisture .....	17	as affected by humic acid .....	324
fertilizer experiments .....	24,	effect on amylolytic ferments of	
327, 519, 622, 820		brend .....	69
fertilizer experiments, Mass. ....	622	effect on heliotropism .....	531
fertilizer experiments, Mich. ....	723	effect on reproductive process ..	78
flour, analyses .....	164	injurious to cotton plant in	
flour, analyses, N.Dak. ....	67	Egypt .....	27
germination as affected by		movement in alkali soils .....	18
silver nitrate .....	31	neutral, effect on action of alcoh-	
grasses, palatability, Ohio .....	865	hol on plant cells .....	333
green, fertilizing value, N.J. ....	129	San José scale—	
ground, analyses, Ind. ....	263	notes .....	55
growth as affected by sulphur ..	541	notes, Ill. ....	16
heads, fungus disease of .....	845	notes, N.J. ....	15
meal, analyses, Mass. ....	467	remedies .....	54
middlings, analyses .....	72, 283	remedies, Ohio .....	37
middlings, analyses, Ind. ....	263	susceptibility to sprays .....	31
middlings, analyses, N.J. ....	665	Sanal as a green manure .....	5
prices and shrinkage, Ill. ....	337	Sands—	
protein content, following black		of New Hampshire and Ver-	
fallow .....	230	mont .....	75
red dog flour, analyses, Ind. ....	263	of West Virginia .....	36
rusts in Canada .....	51	Sanitation, military, text-book ..	36
straw, analyses .....	164	<i>Sannioidea eritiosa</i> . (See Peach	
straw, composition and digesti-		borer.)	
bility .....	565		
transpiration in .....	522		

# INDEX OF SUBJECTS.

991

	Page.	Schools— Continued.	Page.
Sap—		elementary, home economics in.....	395
ascend in plants, studies.....	727	elementary, nature study in.....	794
electrical conductivity in vegetable tissues.....	825	high, agriculture in.....	395, 692, 793, 897, 898
transfusion of.....	341	high, animal husbandry in.....	195
vegetable, physico-chemical properties.....	30	high, home economics in.....	395
Saponin, insecticidal value.....	359	high, out-of-school work in.....	93
Saprolegniaceae, vegetative vigor and reproduction in.....	824	rural, agriculture in.....	92, 693
Sarcophagidae—		rural, cotton lessons for, U.S. D.A.....	293
<i>tenella</i> —		rural, exercises with plants and animals, U.S.D.A.....	292
studies.....	384	rural, in Denmark, treatise.....	196
studies, Wyo.....	658	rural, in Minnesota.....	195
<i>Sarcophaga vericauda</i> , notes.....	66	rural, in Ontario.....	196
Sarcophagid larvae from painted turtle.....	756	rural, manual training in.....	395
Sarcophagidae, economic relations.....	251	rural, organization and management.....	292
<i>Saskatchewania canadensis</i> n.g. and n.sp., description.....	64	secondary, agriculture in.....	491, 693, 793
Sausage—		<i>Sciarra</i> sp., dipterous parasite of.....	553
bacterial examination.....	780	Science—	
water content.....	365	and common sense, antagonism.....	401
Saw mills, portable, forest utilization with.....	642	yearbook.....	494
Sawdust, effect on soil phosphates, Tex.....	421	<i>Scirphophaga intacta</i> , notes.....	758
Saxifiles, mating habits.....	557	<i>Sclerospora macrospora</i> in France.....	243
Saxifrages, treatise.....	45	<i>Sclerotinia</i> —	
Say's blister beetle, notes.....	752	<i>cinerea</i> as affected by cold, U.S. D.A.....	558
Scales. (See Horse and Sheep scab.)		<i>cinerea</i> in Minnesota, U.S.D.A.....	445
Scale—		<i>fructigena</i> , notes.....	241
insects in Hawaii.....	59	<i>fructigena</i> , transmission by tree crickets.....	653
soil, notes.....	652	<i>libertianna</i> , studies, Cal.....	749
<i>Scabius cetrivorus</i> n.sp., description.....	456	<i>opuntiarum</i> , notes.....	543
<i>Scarabaeus hemipterus</i> , notes.....	454	<i>panacis</i> , notes, Mich.....	244
<i>Scenobia tenthredinarum</i> n.sp., description.....	456	<i>sclerotiorum</i> , studies.....	443
<i>Schistocerca paranensis</i> , notes.....	854	sp. on alfalfa, S.C.....	643
<i>Schizocnema</i> —		spp. on ginseng, U.S.D.A.....	359
<i>americana</i> , studies, Me.....	161	<i>trifoliorum</i> , relation to clover sickness, Ky.....	541
<i>lenigera</i> . (See Apple aphid, woolly.)		<i>Sclerotium</i> —	
<i>Schizophyllum commune</i> , relation to apple collar rot, Pa.....	157	<i>bataticola</i> , studies, Del.....	156
<i>Schizotrypanum cruzi</i> , notes.....	580	<i>oryzae</i> , notes.....	49
School—		( <i>Sclerotinia</i> ) <i>opuntiarum</i> , notes.....	543
children, nutrition of.....	561	<i>Scolytus</i> —	
exhibits and contests, outlines for.....	493	<i>quadrispinosus</i> , notes, N.J.....	153
gardening in Philippines.....	795	<i>rugulosus</i> . (See Shot-hole borer.)	
gardening in Trenton, New Jersey.....	899	Scovell, M. A., biographical sketch, Ky.....	694
gardens, care during summer vacation.....	93	Scrapie, notes.....	382
gardens, notes.....	795	Screenings—	
gardens, relation to classroom work.....	92	analyses.....	371, 663
lunches, preparation, U.S.D.A.....	861	analyses, Kans.....	160
lunches, suggestions for.....	257, 661	analyses, N.Dak.....	759
Schools—		feeding value.....	663
agricultural. (See Agricultural schools.)		ground, analyses, N.J.....	665
elementary, agriculture in.....	395, 791, 899	Screw worm fly, new generic name.....	756
		Scurfy scale, notes.....	772
		Sea water as a source of potash.....	327
		Seasons, limits of.....	14
		Seaweed—	
		as a source of potash.....	26, 327
		utilization.....	298
		<i>Sechium edule</i> , notes.....	835

	Page.		Page.
<i>Secodella</i> n.spp., descriptions.....	363	Serodiagnosis, use in grape propaga-	42
Sedge rusts, studies, Ind.....	744	tion.....	42
Seeds—		Serum—	
as affected by pod position,		physiology, international cata-	
N.J.....	134	logue.....	50
as affected by Roentgen rays.....	334	proteases, studies.....	51
buried, germination.....	832	Sesame—	
buried, vitality, Mich.....	732	cake, analyses.....	26
coats of, permeability.....	626	cake, effect on milk and butter.....	57
delayed germination in.....	30	cake for dairy cattle.....	57
germination as affected by		meal, analyses, Mass.....	42
radium.....	626, 730	seed, composition and nutritive	
hard, germinability.....	225	value.....	50
Imports, U.S.D.A.....	336, 527	wilt, notes.....	51
industry in New York.....	40	<i>Setaria viridis</i> , analyses, N.Dak.....	3
inspection in Maine, Me.....	736	Sewage—	
inspection in New Hampshire,		as a source of ammonium sul-	
N.H.....	531	phate.....	43
inspection in New Jersey, N.J.....	832	bacteriology.....	50
inspection in Pennsylvania, Pa.....	143	disposal.....	50
inspection in Wisconsin, Wis.....	143	disposal, Wash.....	79
law in Wisconsin, Wis.....	143	disposal by means of septic	
preparation and mounting.....	94	tank.....	50
proteins of, differentiation.....	577	disposal in country homes.....	58, 286, 35
purity tests, apparatus and		disposal in industrial and rural	
methods.....	832	communities.....	48
sampling.....	832	disposal in rural districts.....	592, 67
translocation of mineral con-		disposal systems, small, con-	
stituents, U.S.D.A.....	427	struction.....	50
vegetable, growing in Canada.....	635	fertilizing value.....	59
vitality after passing through		filters, tests.....	50
cattle.....	531	irrigation.....	50
weed content.....	832	irrigation in Germany.....	60
weed, description, Wis.....	143	oxidation without filters.....	50
weed, in screenings.....	663	purification.....	50
weed, in soil, Ind.....	736	purification and disposal in Ger-	
Seepage from irrigation reservoirs		many.....	60
and canals.....	387	purification by forced aeration.....	48
Seismic zones, detection, U.S.D.A.....	118	sludge, analyses.....	222, 423, 65
Seismology at Pan American Scien-		sludge, fertilizing value.....	222, 423, 65
tific Congress, U.S.D.A.....	615	sludge, fertilizing value, Cal.....	20
Selection, mass, effects of.....	74, 564	sludge for arid soils.....	62
Semipermeable membranes, diffusion		sludge, utilization.....	287, 332, 59
through.....	626	treatment, Dickson centrifuge	
Sensitizin and precipitin, relation-		system.....	42
ship.....	778	treatment plants, residential,	
Separators. (See Cream separa-		construction.....	5
tors.)		treatment with activated sludge.....	28
Septic tanks, design and construc-		Sewerage practice, treatise.....	50
tion.....	887	Sewers, design and construction.....	50
Septicemia, hemorrhagic—		Sewing, teaching.....	86
immunization.....	184	Sex—	
in cattle in California and		control in rotifers.....	76
Nevada.....	782	determination, studies.....	504, 84
in cattle in New York.....	478	heredity. (See Heredity of	
papers on.....	184	sex.)	
<i>Septoglaum anemones</i> n.sp., de-		Sexual development as affected by	
scription.....	242	pituitary feeding.....	76
Septoria—		Sheep—	
<i>albiginis</i> , n.sp., notes.....	842	blowflies, remedies.....	25
<i>latitcola</i> , studies, Del.....	156	branding paints, tests, Wyo.....	68
<i>lycopersici</i> on tomatoes.....	53	breeding experiments, Idaho.....	78
<i>perilla</i> n.sp., description.....	242	breeding, maintenance rations	
<i>petroselinii</i> <i>apli</i> , notes.....	49, 350	for, Pa.....	70
<i>piricola</i> , notes.....	846	breeds in New Zealand.....	76

Sheep—Continued.		Page.	Shrubs—Continued.		Page.
caracul, characteristics and crossing experiments.....		372	ornamental, blooming dates, N.J.....		144
Corriedale, origin and development.....		566	ornamental, for Florida.....		535
Corriedale, record association.....		869	propagation.....		533
diseases, nature and treatment.....		383	treatise.....		345
dual-purpose range, breeding.....		566	varieties, U.S.D.A.....		231
feeding experiments.....		73	Shucks, ground, analyses.....		767
feeding experiments, Pa.....		171	Sickness, effect on growth of the brain.....		662
feeding experiments, Wyo.....		667	<i>Sida rhombifolia</i> , analyses.....		35
handling in California.....		868	Slage—		
industry of United States, New Zealand, and Australia, U.S. D.A.....		372	bacteriological studies.....		766
inheritance in.....		864	beet top, inoculation with lactic acid bacteria.....		767
inheritance of twinning in, U.S.D.A.....		73	crops, notes, Cal.....		192
inheritance of wool production.....		74	digestibility in mixed rations, Ga.....		169
intestinal parasites of.....		188	feeding, Cal.....		192
maggot flies, notes.....		64	for sheep, Pa.....		171
management on National Forests.....		868	from soft corn ears.....		371
manure, analyses, Conn.State.....		521	notes.....		565
nematodes affecting.....		275	oat and pea, analyses, Wyo.....	467, 647	
on alfalfa farms in Texas.....		73	stacking.....		565
open range v. pasture and corral method of lambing.....		868	v. beets and mangels for milk production, Ohio.....		670
pasture system for.....		566	value and use.....		665
raising in North and South America.....		305	Silkworms, breeding experiments.....		552
reversion in.....		73	Silos—		
scab, control in California.....		275	concrete, construction.....	88, 488	
scab, control in Hawaii.....		477	construction.....		892
scab in Great Britain.....		382	construction, Cal.....		192
shearing sheds and yards, construction.....		789	filling, Kans.....		138
Shelter belts, planting in northern Great Plains, U.S.D.A.....		742	German types, description.....		565
Shipstuff, analyses.....	263, 566,	767	stave, construction.....		488
Shout typhoid, studies.....		82	Silt carried by streams of Alps and Pyrenees.....		512
<i>Shorea robusta</i> , natural reproduction and improvement.....		347, 839	Silver—		
Shorts—			leaf disease, studies.....		744
analyses.....	263, 566, 663,	767	nitrate, effect on germinability of wheat.....		31
analyses, Kans.....		169	<i>Stimulium</i> —		
use in poisoned bait for cutworms.....		358	<i>maculatum</i> , oviposition.....		554
Shot-hole borer affecting loquats.....		361	n.sp. from Texas.....		64
Shredded wheat waste, analyses, N.J.....		665	n.spp. from tropical America.....		554
Shrubs—			spp., studies, U.S.D.A.....		756
acclimatization, U.S.D.A.....		231	Stnaps oil, insecticidal and larvicidal value.....		359
berry-bearing, for birds.....		238	<i>Rhiponophora pisi</i> , remedies.....		755
bibliography.....		238	Sires, popular, in animal breeding.....		370
culture and care, N.Dak.....		836	Sirup, analyses.....		660
for home grounds, N.Y.Cornell.....		741	Sisal leaf disease, notes.....		442
for Illinois.....		45	<i>Sitona lineata</i> , biology.....		65
for latitude of St. Louis.....		439	Skin milk—		
new or noteworthy, from Colombia and Central America.....		827	for young calves, Ind.....		774
of Konahuant region.....		537	pasteurization, N.Y.State.....		673
of Missouri River basin.....		838	powder, heated, nutritive value.....		369
of Oahu lowlands.....		345	Skin disease of cattle in Antigua.....		478
of Pacific coast.....		152	Skuns, North American, distribution and migration, U.S.D.A.....		158
			Skunk farming, notes.....	269, 873	
			Slag, (See Phosphatic slag.)		
			Slaughterhouse offal, feeding value.....		866
			Slaughterhouses, construction, Ky.....		767
			Sludge, activated, analyses and fertilizing value.....		520

	Page.	Sodium—Continued.	Page.
Slugs, feeding habits.....	458	salts, effect on germination and growth of crops, U.S.D.A.....	12
Smallpox—		sulphur mixture, insecticidal value, U.S.D.A.....	56
complement fixation in.....	877	Soft drinks—	
in pigs, Cal.....	275	examination, Ky.....	106
Smelter fumes, effect on vegetation.....	526	use of second-hand kegs for, N.Dak.....	29
Smoke—		Soil—	
as a source of atmospheric pollution.....	715	acidity, cause and detection.....	46
from lead works, effect on horses.....	278	acidity, determination.....	66
from Mt. Hood, U.S.D.A.....	414	aeration in relation to temperature, Mich.....	73
injury to plants.....	744	bacteria, nonsymbiotic nitrogen-fixing.....	87
pollution, plants as an index.....	299	bacteria, potash-fixing power.....	82
Snakes, destruction of field mice.....	751	bacteria, relation to fertilizers.....	22
Snapdragon disease in Barbados.....	841	bacteria, relation to soil fertility, U.S.D.A.....	66
Snow—		bacteria, relation to soil protozoa.....	28
determination of density.....	510	colloids, adsorptive power.....	5
nitrogen, chlorine, and sulphates in.....	615	colloids, importance.....	16
surface, condensation upon and evaporation from, U.S.D.A.....	413	colloids, treatise.....	52
survey on Cottonwood Creek, Idaho, U.S.D.A.....	614	condition, relation to bacterial activity.....	51
Soap solutions, analyses, N.Dak.....	661	erosion, notes.....	818, 85
Social welfare in United States.....	791	erosion, prevention, Mo.....	54
Sod oil, insecticidal value.....	359	erosion, prevention, N.C.....	53
Soda—		fatigue, review of literature.....	54
cellulose, notes.....	714	fertility as affected by fertilizers.....	57
lime, history and uses.....	804	fertility as affected by lime and chalk.....	51
Sodium—		fertility, determination.....	25
acid phthalate in acidimetry and alkalimetry.....	408	fertility, dynamic theory.....	55
arsenate-kerosene emulsion, insecticidal value.....	652	fertility, improvement.....	56
arsenite, effect on soils, U.S.D.A.....	421	fertility, maintenance.....	518, 62
arsenite, killing of ribbarked (rees with.....	485	fertility, maintenance, Iowa.....	52
chlorid. (See Salt.).....		fertility, maintenance, Ohio.....	52
fluorid, insecticidal value, Mich.....	252	fertility, notes.....	52
hydrate, effect on permeability.....	429	fertility, notes, Ill.....	52
hypo-iodite, neutral, action on formaldehyde.....	11	fertility, relation to bacteria U.S.D.A.....	6
lamp for polariscope.....	804	fertility, relation to sulphur.....	2
nitrate, availability in relation to soils, N.J.....	130	fertility, relation to weeds, N.Dak.....	3
nitrate, effect on composition of meadow hay.....	620	fungi of Norway.....	13
nitrate, effect on protein content of soy beans, N.J.....	141	gases, studies.....	51
nitrate, fertilizing value.....	22, 24, 25, 518, 520, 622, 820	humidity, effect on development of cotton.....	21
nitrate, fertilizing value, N.J.....	129	inoculation, review.....	21
nitrate, fertilizing value, Pa.....	128	micro-organisms, longevity on drying, U.S.D.A.....	53
nitrate, fertilizing value as affected by lime, N.J.....	132	moisture as affected by crops.....	1
nitrate for cranberries, N.J.....	150	moisture, movement in relation to temperature, U.S.D.A.....	13
nitrate for early vegetables, Ill.....	532	moisture, relation to temperature, Pa.....	5
nitrate, history and manufacture.....	423	moisture, studies, Tex.....	13
pyrophosphate, toxicity.....	476	physics, manual.....	13
		protozoa, activity, U.S.D.A.....	5
		protozoa, counting.....	5
		protozoa, investigations, U.S.D.A.....	5

Soil--Continued.	Page.
protozoa, relation to soil bac-	
teria-----	326
protozoa, separation, U.S.D.A.-----	217
sampler, description-----	513, 811
sanitation, notes, Ind-----	744
solution, concentration-----	419
solution, concentration, Mich-----	721
solution, protective effect on	
soil organisms, U.S.D.A.-----	732
solutions, relative concentra-	
tions-----	323
survey in--	
Alabama, Bullock Co., U.S.	
D.A.-----	210
Alabama, Cleburne Co., U.S.	
D.A.-----	119
Alabama, Escambia Co.,	
U.S.D.A.-----	210
Alabama, Lawrence Co.,	
U.S.D.A.-----	615
Alabama, Limestone Co.,	
U.S.D.A.-----	717
Alabama, Russell Co., U.S.	
D.A.-----	119
Alaska, U.S.D.A.-----	209
Arkansas, Columbia Co.,	
U.S.D.A.-----	717
Arkansas, Pope Co., U.S.	
D.A.-----	119
California, Sacramento Val-	
ley, U.S.D.A.-----	120
Florida, Fort Lauderdale	
area, U.S.D.A.-----	210
Florida, Hernando Co., U.S.	
D.A.-----	211
Florida, Indian River area,	
U.S.D.A.-----	211
Florida, Putnam Co., U.S.	
D.A.-----	717
Georgia, Colquitt Co., U.S.	
D.A.-----	417
Georgia, Dekalb Co., U.S.	
D.A.-----	417
Georgia, Jackson Co., U.S.	
D.A.-----	417
Georgia, Stewart Co., U.S.	
D.A.-----	120
Georgia, Tatnall Co., U.S.	
D.A.-----	510
Georgia, Terrell Co., U.S.	
D.A.-----	211
Illinois, Pike Co., Ill-----	15
Indiana, Clinton Co., U.S.	
D.A.-----	510
Indiana, Delaware Co., U.S.	
D.A.-----	120
Indiana, Hendricks Co.,	
U.S.D.A.-----	120
Iowa, Lee Co., U.S.D.A.-----	809
Iowa, Pottawattamie Co.,	
U.S.D.A.-----	616
Kansas, Cherokee Co.,	
Kans-----	809
Kansas, Montgomery Co.,	
U.S.D.A.-----	121

Soil--Continued.	Page.
survey in--continued.	
Kansas, Reno Co., Kans-----	809
Kentucky, Franklin Co.,	
Ky-----	322
Kentucky, Graves Co., Ky-----	122
Mississippi, Clarke Co.,	
U.S.D.A.-----	511
Mississippi, Jones Co., U.S.	
D.A.-----	122
Mississippi, Wilkinson Co.,	
U.S.D.A.-----	211
Missouri, Greene Co., U.S.	
D.A.-----	122
Missouri, Grundy Co., U.S.	
D.A.-----	511
Missouri, Harrison Co.,	
U.S.D.A.-----	616
Missouri, Nodaway Co.,	
U.S.D.A.-----	123
Missouri, Perry Co., U.S.	
D.A.-----	123
Nebraska, Douglas Co.,	
U.S.D.A.-----	211
Nebraska, Nemaha Co.,	
U.S.D.A.-----	717
Nebraska, Saunders Co.,	
U.S.D.A.-----	212
Nebraska, Scotts Bluff Co.,	
U.S.D.A.-----	511
New Jersey, Freehold area,	
U.S.D.A.-----	616
New York, Oneida Co., N.Y.	
Cornell-----	718
New York, Oneida Co.,	
U.S.D.A.-----	123
North Carolina, Bladen Co.,	
U.S.D.A.-----	418
North Carolina, Randolph	
Co., U.S.D.A.-----	124
North Carolina, Rowan Co.,	
U.S.D.A.-----	212
North Carolina, Union Co.,	
U.S.D.A.-----	810
Ohio, Paulding Co., U.S.	
D.A.-----	212
Ohio, Portage Co., U.S.D.A.-----	810
Ohio, Stark Co., U.S.D.A.-----	124
Oklahoma, Bryan Co., U.S.	
D.A.-----	617
Oklahoma, Muskogee Co.,	
U.S.D.A.-----	213
South Carolina, Chester-	
field Co., U.S.D.A.-----	418
Tennessee, Jackson Co.,	
U.S.D.A.-----	213
Texas, Jefferson Co., U.S.	
D.A.-----	213
Texas, south-central area,	
U.S.D.A.-----	213
Utah, Cache Valley area,	
U.S.D.A.-----	214
Washington, Stevens Co.,	
U.S.D.A.-----	214
West Virginia, Logan and	
Mingo counties, U.S.D.A.-----	124

Soil—Continued.	Page.	Soils—Continued.	Page.
survey in—Continued.		cultivated, loss of nitrogen and	713
Wisconsin, Bayfield area..	617	organic matter from .....	48
Wisconsin, Buffalo Co., U.S.		Cyanophyceæ in .....	420
D.A. ....	215	decomposition of peptone and	
Wisconsin, Dane Co., U.S.		cellulose in .....	51
D.A. ....	418	effect on availability of ferti-	
Wisconsin, Iowa Co.....	617	lizers, N.J. ....	13
Wisconsin, northeastern,		effect on composition of me-	
U.S.D.A. ....	617	dical plants .....	1
Wisconsin, Waukesha Co..	617	effect on pecans, Ga.....	17
Wisconsin, Waushara Co..	617	fermentation of manure by ..	52
surveys, development and eco-		fertilizer requirements .....	22, 518, 891
nomie value .....	513	fertilizer requirements, Ky.....	65
surveys in United States, U.S.		fertilizer requirements, U.S.	
D.A. ....	321	D.A. ....	31
surveys, probable error of sam-		formation and composition,	
pling in .....	513	Ohio .....	69
temperature as a factor in		formation and properties .....	25
agriculture .....	419	humus extracted, productiv-	
temperature as affected by cul-		ness .....	58
tural methods, U.S.D.A.....	217	humus, of Java and Malay	
temperature, factors affecting..	514	Peninsula .....	511
temperature, relation to air		hydrogen-ion concentration, de-	
temperature .....	15	termination .....	59
temperature, relation to cli-		laboratory manual .....	66
mate .....	319	light, mixing with clay .....	95
temperature, studies .....	818	lime requirements .....	83
toxins, formation .....	218	lithium in .....	27
Soils—		loess, of transition region, of	
absorption of ultraviolet and		Nebraska .....	92
infra-red rays by .....	817	mapping .....	27
adaptation to wheat or rye ..	813	methods of analysis .....	90
adsorptive power .....	18, 515	moor, liming experiments .....	1
aeration .....	334, 514	niter spots in .....	511, 87
alkali, analyses .....	512	nitrifying power .....	218, 87
alkali, as affected by irrigation	16	nitrogen fixation in .....	45
alkali, drainage, Cal .....	283	nitrogen transformation in ..	45
alkali, effect on concrete drain-		nitrogen transformation in, U.S.	
age tile .....	584	D.A. ....	68
amino acids in .....	515	of Belgian Kongo, analyses ..	72
ammonia adsorption by .....	719	of California, analyses .....	24
analyses, Ohio .....	810	of Clermont and Paulding coun-	
and plants, water relation be-		ties, Ohio .....	89
tween .....	521	of Hudson Valley, New York ..	47
animal organisms of .....	306	of Iowa, analyses .....	9
arid, humus of, U.S.D.A.....	719	of Iowa, analyses and fertility,	
arid, nitrogenous fertilizers for	621	Iowa .....	72
arid, nitrogenous fertilizers for,		of Iowa, sulphur content .....	13
Cal .....	210	of Kentucky, Ky .....	81
as affected by ammonium sul-		of lower Rhine districts .....	81
phate, Mass .....	622	of Mauritius, absorptive power	58
as affected by arsenical sprays,		of Mohawk Valley, New York ..	72
U.S.D.A. ....	421	of New Zealand, analyses .....	65
as affected by cowpeas, U.S.D.A.	420	of North Carolina, petrography,	
as affected by dynamite, Knos..	819	U.S.D.A. ....	25
as affected by dynamite, Pa.....	125	of north Wales .....	9
as affected by heat .....	722	of Norway .....	67
atmosphere of .....	514	of Nova Scotia, analyses .....	15, 22
biochemical reduction processes		of Paraguay, analyses .....	89
in .....	217	of Perugia, Italy .....	73
brown, of Java and Malay		of Philipplines, nitrification in	
Peninsula .....	811	of San Luis Province, Argen-	
chernozem, nitrate content .....	618	tina .....	37
cultivated, absorption of salts		of Sierra Leone .....	32
by .....	324	of Tennessee .....	35

Soils—Continued.	Page.	Sorghum—Continued.	Page.
of Texas Panhandle, Tex.....	124	culture experiments, Wyo.....	650
of Tripoli, solutions of.....	323	grain, culture experiments, U.S.	
of western Washington, Wash..	418	D.A. ....	229
peat, adsorptive power.....	515	grain, culture under irrigation.	
peat, in Minnesota and Wis-		U.S.D.A. ....	229
consin.....	618	loose kernel smut, studies.....	444
peat, trentise.....	618	moisture content and shrinkage.	
physical processes in relation to		U.S.D.A. ....	828
temperature, Mich.....	216	transpiration in.....	522
potassium adsorption by.....	817	varieties, Cal.....	227
productivity as affected by dry		Sorrel, red, destruction, Ind.....	736
air storage.....	812	South Carolina Station—	
productivity of different layers..	215	notes.....	199, 497
proteoses and peptones in.....	325	report.....	694
reaction in relation to grinding..	112	South Dakota—	
reaction of.....	504	College, notes.....	97
relation to climate and		Station, notes.....	97
weather.....	514	Station, report.....	197
sulphur oxidation in.....	19	Southern States Conference on Sec-	
sulphur treatment.....	540	ondary Agricultural Education...	799
surface area.....	419	Sows, wintering, colony-house sys-	
trentise.....	321, 716, 793	tem, N.J.....	173
tropical, black color of.....	217	Soy bean—	
ventilation and drainage.....	217	cake, effect on milk and butter..	570
water-holding capacity, Wash..	494	flour, use.....	859
water-supplying power.....	721	meal, analyses.....	263
white, of upper Weser River.....	16	meal, methods of analysis.....	311
Wisconsin drift, management,		oil, hydrogenated, properties....	9
Iowa.....	722	oil, oxidation and polymeriza-	
Solanin—		tion.....	407
as a potato poison.....	164	Soy beans—	
determination in tomatoes.....	255	analyses.....	37, 311
<i>Solanum nigrum</i> , crossing with		analyses, N.J.....	141
prairie berry, N.J.....	146	as affected by pod position.	
Solar—		N.J.....	134
activity and atmospheric opti-		botanical history.....	336
cal phenomena, U.S.D.A.....	614	carbohydrates and enzymes of...	311
corona, rotation, U.S.D.A.....	414	cost of production, N.J.....	137
eclipse at Honolulu, U.S.D.A....	118	culture, Colo.....	630
photosphere, spectrum and tem-		culture experiments, Miss.....	227
perature of, U.S.D.A.....	413	culture experiments, Nebr.....	228
radiation, papers on, U.S.D.A....	413, 614	culture in Mississippi.....	37
radiation, seasonal variations..	415	factors affecting protein con-	
<i>Solenopsis</i> .....		tent, N.J.....	140, 632
<i>debilis</i> , notes.....	752	feeding value.....	37
<i>grainata</i> , notes.....	753	feeding value, Tenn.....	867
<i>Solidago</i> n.sp., descriptions.....	336	fertilizer experiments, Mass.....	294
Solids, determination in milk and		fertilizer experiments, N.J.....	152
other fluids.....	206	lipase of.....	111
Solutions—		use in infant feeding.....	859
determination of mineral salt		varieties, Miss.....	228
content, Mich.....	732	varieties, Nebr.....	228
evaporation apparatus for.....	608	varieties, N.J.....	632
Soot—		yields, Nebr.....	228
analyses, Conn.State.....	521	<i>Sphaerostilbe repens</i> , notes.....	57
effect on growing plants, Pa....	154	Spaghetti as a medium for growth	
fall in English towns and cities..	15	of typhoid fever bacillus.....	69
Sore throat epidemic, relation to		<i>Sparpanothis (Anophthira) pillici-</i>	
milk supply.....	473	ana, notes.....	63
Sorghum—		Sparrows, dissemination of Vir-	
breeding for drought resistance,		ginia creeper by.....	629
U.S.D.A.....	528	Spearmint, culture, U.S.D.A.....	151
culture, Colo.....	630	Spelt -	
culture, S.C.....	691	culture experiments, Ga.....	158
culture experiments, Miss.....	227	varieties, U.S.D.A.....	733

	Page.	Stable—	Page
Sperm oil, hydrogenated, properties..	9	nir as a source of bacteria in	
Spermatozoa, duration after fe-		milk, N.Y.State.....	183, 47
cundation in pullets and ducks....	864	fly, relation to filaria in horses..	30
<i>Sphacelotheca cruenta</i> and <i>S. sorghi</i> ,		fly, relation to plague-like dis-	
confusion .....	444	ease of rodents.....	32
<i>Sphaeronema fimbriatum</i> , studies,		Stallions in Wisconsin, Wis.....	35
Del.....	156	Staphylococcus vaccine, tests.....	76
<i>Spharopsis</i> —		Starch—	
<i>maiorum</i> as affected by cold,		determination in potatoes....	50, 72
U.S.D.A.....	538	digestibility in mixed rations,	
<i>maiorum</i> , notes .....	54, 247, 644	Ga.....	39
<i>maiorum</i> , relation to apple col-		effect on peptic digestion.....	37
lar rot, Pa.....	157	effect on soil phosphates, Tex....	47
<i>maiorum</i> , transmission by tree		elaboration in <i>Iris germanica</i> ....	51
crickets .....	653	formation in plants.....	52
<i>tumefaciens</i> on limes.....	349	humification .....	73
<i>Sphaerotheca</i> —		phosphoric acid in.....	77
<i>macrospora</i> on currants.....	648	products, examination .....	7
<i>macrospora</i> , treatment.....	843	use in food products.....	36
<i>pinnosa</i> on raspberry.....	740	State departments of agriculture,	
<i>pinnosa</i> , treatment.....	442, 750	functions of .....	86
Sphagnum moss, temperature condi-		Steers—	
tions in.....	715	digestion experiments, Ga.....	39
<i>Spicaria solani</i> , notes.....	413	feeding experiments, Kans.....	37
Spices—		feeding experiments, Ky.....	36, 36
culture in Dutch East Indies....	345	feeding experiments, N.Mex....	78
culture in Philippines.....	635	feeding experiments, Tenn.....	37
handbook.....	108	feeding experiments, Tex.....	36
Spider—		<i>Stenares</i> n.sp., notes.....	37
red, effect on potato foliage....	449	<i>Stenoptycha pinicola</i> on larches ..	7
red, in Germany.....	658	<i>Stephanoderes coffea</i> , notes.....	3
red, in Ohio, Ohio.....	59	<i>Stephanurus dentatus</i> , description..	28
red, notes.....	60	<i>Stercum</i> —	
Spinach, fertilizer experiments, Ill..	532	<i>purpureum</i> , notes.....	21
<i>Spirobolus marginatus</i> , life history..	364	<i>subpileatum</i> , studies, U.S.D.A....	46
Spirochetes in papillomatous neo-		<i>Stictococcus dimorphus</i> , notes.....	49
plasma in horses.....	280	<i>Stizolobium pachylobium</i> beans, feed-	
<i>Spirogyra</i> —		ing value.....	23
<i>inflata</i> , variability in zygos-		Stock. (See Live stock.).....	47
pores .....	370	Stomach, physiology of.....	47
<i>marima</i> , tannin in.....	825	<i>Stomazys calcitrans</i> . (See Stable	
<i>Spondylocidium atrovirens</i> , notes....	443	fly.) .....	
<i>Spongospora</i> —		Storm—	
<i>solani</i> , notes.....	241	frequency changes in United	
<i>subterranea</i> , native habitat.....	615	States, U.S.D.A.....	17
<i>subterranea</i> , studies.....	443	of August 10, 1915, U.S.D.A....	12
<i>Sporthrix schenckii-beurmanni</i> ,		Storms—	
studies.....	384	in Jamaica, U.S.D.A.....	65
Sporotrichosis, investigations.....	384, 385	terms used to designate, U.S.	
Spray injury and its prevention, Pa..	154	D.A.....	18
Spraying—		Stramonium, as affected by compo-	
notes.....	548	sition of soils.....	5
notes, Mich.....	436	Strangles—	
Spruce—		immunization .....	59
bud moth, notes.....	752	in horses.....	13
bud scale, notes.....	752	Straw—	
Engelmann, volume tables for...	641	as human food.....	26
growth and yield in high moun-		composition and digestibility..	26
tains.....	347	damaged, as a source of potash..	71
of Rocky Mountains, U.S.D.A....	742	grades of.....	72
Squidreia—		meal as a feed for pigs.....	73
flying, new genus and races of...	850	meal bread for cattle.....	76
ground, in Colorado.....	651		
ground, notes, Wash.....	753		

# INDEX OF SUBJECTS.

999

	Page.		Page.
strawberries—		Sugar beet—	
culture, N.Y.State.....	42	curly leaf, bacterial origin.....	645
culture in Mexico.....	834	curly top, notes, Cal.....	241
improvement in Minnesota.....	637	curly top, transmission by in-	
liming experiments, Pa.....	150	sects.....	646
propagation and shipping ex-		diseases, notes.....	350
periments.....	637	pulp. (See Beet pulp.).....	
varieties, Oreg.....	231	root rot, studies.....	52
strawberry—		seedlings in relation to <i>Phoma</i>	
leaf petiole gall, notes.....	362	<i>beta</i> , U.S.D.A.....	156
slugs, studies, Iowa.....	758	tops, analyses and feeding	
weevil, notes, N.J.....	158	value.....	664
stream measurement stations, equip-		tumors, formation.....	845
ment for.....	84	Sugar beets—	
streets, cleaning.....	484	and their products in bread	
<i>Streptococcus lacticus</i> —		making.....	660
origin in milk.....	473	culture.....	482
types of.....	77	culture experiments.....	37
<i>Streptococcus vaccine</i> , tests.....	580	culture experiments, Can.....	34
<i>Stenophylus paradoxus</i> , description..	280	culture experiments, U.S.D.A.....	229
Strongylus, studies.....	879	culture under irrigation, Colo.....	528
Strychnin—		effect on milk.....	472
detection in water.....	410	fertilizer experiments.....	24, 38, 519
sulphate, effect on quail.....	850	growth as affected by alkali	
student budgets in Smith College.....	762	salts, U.S.D.A.....	125
Sucrose—		leaf infection with <i>Cercospora</i>	
acetates of.....	408	<i>beticola</i> , U.S.D.A.....	845
determination in condensed		poisoning of live stock by.....	80
milk.....	612	seed infection in.....	747
effect on action of alcohol on		sugar content in relation to	
plant cells.....	333	foliage.....	38
inversion of.....	13	variation in sugar content.....	37
Sudan grass—		varieties.....	37
analyses, Okla.....	577	yield in relation to direction	
culture, S.C.....	694	of rows.....	38
culture and feeding value, Ohio.....	831	Sugar cane—	
culture experiments, Cal.....	227	beetle, notes.....	757
culture experiments, Miss.....	227	borer, relation to rainfall and	
culture experiments, U.S.D.A.....	229	trash.....	552
culture experiments, Wyo.....	630	borers, notes.....	556, 753, 758
insects affecting.....	440	culture experiments.....	431
irrigation experiments, N.Mex.....	735	culture in India.....	227
Sugar—		diseases, notes.....	49, 349, 539, 841
as a feeding stuff.....	566	dry disease, notes.....	442
determination in food products.....	205	fertilizer experiments.....	431, 831, 832
determination in urine.....	807	field experiments, experimental	
for children.....	164	error in.....	38
for horses.....	760	growth.....	627
for infants.....	258	insects affecting.....	349, 539
from cornstalks.....	113	Japanese, analyses, Fla.....	831
inversion and fermentation in		Japanese, culture and use, Fla.....	831
flour.....	680	Japanese, fertilizer experiments,	
inversion of.....	13	Fla.....	831
locating in plant tissues.....	729	leaf-hopper, notes.....	753
manufacture, treatise.....	508	products, relation to pellagra..	258
maple sap, composition, U.S.		root borer, bird enemies of,	
D.A.....	428	U.S.D.A.....	849
reducing, determination.....	13, 611	root disease, studies, U.S.D.A.....	50
refinery sewage, purification.....	591	root grubs, parasites of.....	455
refinery sludge, analyses and		severe disease.....	52
fertilizing value.....	520	stomatal structure.....	628
residues as a source of potash.....	328	top rot, notes.....	628
waste in baking.....	660	varieties.....	431
(See also Cane sugar.)		Sugi leaves, essential oil of.....	802
		Sulfonation in soils, Iowa.....	19

	Page.		Page.
Sulphate of ammonia. (See Ammonium sulphate.)		Sweede midge in Yorkshire	439
Sulphates—		Swedes—	
determination in bread	205	effect on milk and butter	559
determination in soils	10	fertilizer experiments	491
effect on growth of red clover,		susceptibility to mildew	52
U.S.D.A.	625	varieties	895
Sulphids, insecticidal value	61	Sweet clover—	
Sulphur—		culture, Colo.	659
atomic, fungicidal value, N.J.	146	culture under dry farming,	
compound, soluble, analyses,		Idaho	734
Mich.	436	culture under irrigation, Colo.	529
compounds, fertilizing value,		Inoculation	523
U.S.D.A.	221	seed, germination tests, Wyo.	659
dioxid, effect on vegetation	526	Sweet corn—	
dioxid in atmosphere of Selby		breeding experiments, N.J.	144
smoke zone	716	culture, Ariz.	232
dioxid injury to plants	745	culture, N.Y. State	41
dust, fungicidal value, N.J.	146	papago, investigations, Ariz.	232
effect on growth of red clover,		pollination studies, Ariz.	233
U.S.D.A.	625	sugar content as affected by de-	
effect on plant growth	331, 726	tasseling	434
effect on sugar beets	38	treatise	41
fertilizing value	540	viability tests, N.J.	145
in Iowa soils	27	Sweet peas—	
interseasonal movement	426	as an indicator of gas in soils	245
mixtures. (See Lime-sulphur		treatise	238
mixture.)		varieties	345
paste, fungicidal value, N.J.	146	Sweet potato—	
relation to soil fertility	27	diseases, studies, Del.	156
spray injury, prevention, Pa.	154	scurf, studies, U.S.D.A.	646, 747
Sulphuric acid, manufacture, U.S.		weevil, notes	65
D.A.	9	Sweet potatoes—	
Sulphurous acid—		carbohydrate transformations	
action on rock phosphate	220	in, U.S.D.A.	522
use in wine making, Cal.	207	circulation in	135
Summers, American, classification,		respiration experiments, U.S.	
U.S.D.A.	118	D.A.	426
Sun spot frequencies, U.S.D.A.	117	varieties	431
Sundri timber, notes	240	varieties resistant to stem rot	444
Sunflower-seed cake, effect on milk		Swine—	
and butter	576	erysipelas in Great Britain	582
Sunflowers—		plague, auto-infection in	579
insects affecting	450	(See also Pigs.)	
marking factors in	341	Sycamore blight, notes	56
specific and varietal characters	237	<i>Sylvanus</i> spp., notes	734
Sunlight—		<i>Symphoromyia</i> attacking man	554
effect on flower color	237	Symptomatic anthrax. (See Black-	
relation to respiratory activity	30	leg.)	
Superphosphate—		<i>Synchytrium endobioticum</i> , studies	844
double, fertilizing value	35	<i>Syntherisma bloddarii</i> n.g. and n.sp.,	
enriched, from precipitated		description	364
phosphate	330	Syrphus fly, corn-feeding, life his-	
fertilizing value	22, 25, 330, 518, 519	tory	358
for cranberries, N.J.	150	Tachinidae, new nocturnal species	360
for wheat under semiarid con-		<i>Tachinophyto (Hypostena)</i> sp., para-	
ditions	519	sitic on sugar cane borer	753
manufacture	724	Tamarindillo, culture, P.R.	758
manufacture, U.S.D.A.	329	Tangerine—	
mixing with limestone	26	mildew, notes	619
Suppurative lesions in horses and		powdery mildew in southern	
calves	186	California	447
Swamp fever—		Tankage—	
in New York	280	analyses	571, 588
investigations	185	analyses, Ind.	265
		analyses, Tex.	467

# INDEX OF SUBJECTS.

1001

	Page.		Page.
nkage—Continued.		Temperature—Continued.	
blood, analyses.....	371	low, effect on fungi and bac-	
fertilizing value, N.J.....	129	teria, U.S.D.A.....	538
high-grade, fertilizing value,		low, effect on trichina.....	83
Cal.....	219	low, germicidal effect.....	382
anic acid—		low, of Southern Hemisphere,	
determination in tanning ma-		U.S.D.A.....	118
terials.....	508	of the atmosphere, U.S.D.A.....	614
effect on action of alcohol on		relation to distribution of ma-	
plant cells.....	333	rine algae.....	32
nnin—		variations in a mountain valley,	
in oak heartwood.....	849	Utah.....	613
in Pacific coast conifers.....	508	variations in France.....	415
presence and significance in		<i>Tenebrio obscurus</i> , life history.....	65
plants.....	825	Tent caterpillar, notes.....	654, 752
apiaca—		Tenthredinidae in Luga district of	
flour, use in baking.....	365	Government of Petrograd.....	758
starch, baking tests.....	460	<i>Tephrochlamis canescens</i> , hiberna-	
at for roads.....	684	tion.....	254
crushed plant bug—		<i>Tephrosia</i> spp., fertilizing value.....	34
false, oviposition.....	255	Termites, studies, U.S.D.A.....	754
remedies.....	356	Terraces, construction, N.C.....	819
ra—		Terrestrial magnetism and solar ra-	
Arabian, culture in Egypt.....	232	diation, concomitant changes in,	
diseases, notes.....	744, 835	U.S.D.A.....	614
fertilizer experiments.....	236, 835	Terriers, popular sires of.....	370
green manure crops for.....	344	Testicular cells, interstitial, in	
imports into United States.....	43	chickens.....	264
insects affecting.....	549, 652, 835	Tetanus—	
Java, caffeine in.....	166	toxin-antitoxin mixtures, im-	
red rust, notes.....	55, 249	munization with.....	580
seed gardens, care and manage-		toxin, concentration and purifi-	
ment.....	835	cation.....	579
teachers—		treatment.....	782
agricultural instruction for.....	697, 799	<i>Tetraleurodes mori</i> , notes.....	752
mature study training for.....	692	<i>Tetramorium cespitum</i> as a pest of	
summer schools in Canada.....	597	cold-frame and greenhouse crops,	
Teak—		Va.Truck.....	657
annual ring formation in.....	839	<i>Tetrumychnus</i> —	
forests in Java and Madoera.....	239	spp., notes.....	60
trees and stands, measuring.....	839	<i>tclarius</i> in Ohio, Ohio.....	59
wood, properties and utilization		<i>Tetrastichus</i> n.spp., descriptions.....	66
working plans in Burma.....	839	Texas—	
Teff—		College, notes.....	497
hay, analyses.....	435	Station, notes.....	396, 798
history and culture.....	435	Station, report.....	494
Telephone construction and mainte-		Textile plants, treatise.....	829
nance in National Forests, U.S.		<i>Thecabius populicaulis</i> , notes.....	453
D.A.....	191	<i>Theciteria parva</i> , notes.....	384
Temperature—		<i>Thelia bimaculata</i> , life history.....	255
effect on Glomerella.....	541	Thermometer exposure, uniform,	
effect on human body.....	464	U.S.D.A.....	118
effect on milk fat globules.....	570	Thermo-osmose in soils, Mich.....	216
effect on phototropism.....	628	<i>Thielaviopsis ethacetica</i> , notes.....	841
effect on physical processes in		Thistle, Canada, destruction, Ind.....	736
soils, Mich.....	216	Thomas slag. (See Phosphatic	
effect on strength of concrete.....	889	slag.)	
effect on water movement in		Thomomys, revision, U.S.D.A.....	449
soils, U.S.D.A.....	215	Thorium—	
in British Columbia.....	320	content of earth's crust.....	619
in western and equatorial Africa		effect on permeability.....	34
inversion in Grand River Valley,		Threshing—	
Colo., U.S.D.A.....	614	machinery, cooperative owner-	
inversions in relation to frost.....	715	ship.....	392
low, effect on frogs.....	751	machines, tests.....	891
low, effect on fruit culture in			
New York.....	737		

	Page.		Page.
<i>Thrips</i> —		Tobacco—	
<i>corticis</i> , validity .....	550	breeding experiments, Pa.....	141
<i>tabaci</i> . (See Onion thrips.)		Cuban, classification.....	430
<i>Thrips</i> —		culture experiments, Pa.....	141, 142
new species, in America.....	61	culture in Bihar.....	59
relation to nonsetting of fruits		cutworms affecting.....	455
and seeds .....	355	fertilizing experiments, Pa.....	142
Thrushes, feeding habits, U.S.D.A....	59	industry in Clinton County, Pa....	142
<i>Thunderstorms</i> —		insects affecting.....	546
forecasting, U.S.D.A.....	614	mosaic disease, distribution of	
in United States, U.S.D.A.....	117, 615	virus, U.S.D.A.....	247
<i>Thyridaria tarda</i> , notes.....	640, 744	mosaic or calico disease, studies,	
<i>Thyridopteryx ephemeriformis</i> . (See		Conn.State.....	52
Bagworm.)		of Paraguay.....	28
Thyroid gland, iodine in.....	580	Phytophthora disease, notes.....	744
<i>Thysanoptera</i> —		plants, scald by Paris green.....	351
anatomy and feeding habits.....	355	products, analyses, Mich.....	436
antennal antigeny in.....	356	seed beds, disinfection, Ohio.....	441
new, in America.....	61, 62	smoke, injurious to plants.....	39
Tick fever, Rhodesian. (See Afri-		stems, analyses, Conn.State.....	521
can coast fever.)		stems and stalks, analyses and	
<i>Ticks</i> —		use, S.C.....	519
as affected by dipping.....	186	topping experiments, Pa.....	141, 142
biology.....	857	varieties, Pa.....	142
diseases transmitted by.....	576	wireworm, notes.....	757
eradication.....	184, 185, 273	<i>Tomato</i> —	
of Nigeria.....	851	black spot, notes.....	644
of Uganda.....	549	blight, notes.....	541
(See also Cattle ticks.)		blight, treatment with hot	
<i>Tile</i> , concrete—		water.....	59
construction.....	685	diseases in Barbados.....	841
durability in alkali soils.....	87, 584	diseases, new, notes.....	51
<i>Tilfish</i> , occurrence and use.....	557	pulp, examination.....	15
<i>Tilletia</i> —		rot, studies.....	57
<i>contraversa</i> , notes.....	843	winter blight or spring disease,	
<i>levis</i> , notes.....	644, 845	studies, Pa.....	151
<i>tritici</i> , investigations, Wash.....	644	<i>Tomatoes</i> —	
<i>tritici</i> , notes.....	644, 845	antioxidase of.....	31
<i>Timber</i> —		composition as affected by rain-	
beam design, tables for.....	859	fall.....	625
dry rot, notes.....	751	culture, N.Y.State.....	42
marking for cutting.....	641	double flowers in, N.J.....	115
of Canada.....	239	heredity and correlation of struc-	
of Eritrea.....	440	tures in, N.J.....	144
of New South Wales.....	152	inheritance in.....	42
of South America.....	306	manual.....	757
preservation.....	240	parthenogenesis in.....	233, 757
second growth, determining		seedless, production.....	22
profits in.....	641	selection for wilt resistance.....	616
treatise.....	537	varieties, Pa.....	141
(See also Lumber and Wood.)		varieties, U.S.D.A.....	252
<i>Timothy</i> —		<i>Tomicus radiata</i> n.sp., description..	361
breeding experiments, Can.....	34	<i>Tornado</i> —	
cost of production, N.J.....	137	at Pace, Fla., U.S.D.A.....	615
culture experiments, Can.....	34	in eastern Mississippi, U.S.D.A....	455
liming experiments, Pa.....	133	<i>Tornadoes</i> in Kansas, U.S.D.A.....	
moisture content and shrinkage,		<i>Tortrix</i> —	
U.S.D.A.....	828	<i>fumiferana</i> , notes.....	755
palatability, Ohio.....	865	<i>pillerina</i> , destruction by heat.....	653
rust, infection experiments, U.S.		<i>Toxicity</i> , theory of.....	652
D.A.....	244	<i>Toxins</i> —	
seed, germination tests, Pa.....	143	fixation by leucocytes.....	575
<i>Tiptia parallela</i> , notes.....	455	of intestinal parasites.....	576
<i>Titrating</i> table, portable, descrip-		soil, formation.....	218
tion.....	312		

	Page.	Trees—Continued.	Page.
<i>Tecoptera graminum</i> , remedies, U.S. D.A. ....	653	shade, acclimatization, U.S. D.A. ....	231
Tractors—		shade, insects affecting.....	250, 651
gasoline and oil, directory and specifications.....	891	shade, varieties, U.S.D.A.....	231
harvesting, operation.....	891	street, of New York City.....	345
relation of drawbar pull to weight.....	589	volume tables for.....	641, 743
repairing boilers of.....	800	Trehalose, acetates of.....	408
tests.....	589	<i>Trematopygus eriocampoididis</i> n.sp., description.....	363
Trade winds of Atlantic and northern European seas, U.S.D.A.....	118	Trenching machinery, description, U.S.D.A.....	583
Trails, construction in National Forests, U.S.D.A.....	190	<i>g</i> -Triacetylmethylxylosid, notes.....	408
<i>Trametes pini</i> in India.....	547	<i>Tribolium ferrugineum</i> , notes.....	754
Transpiration—		Tricalcium phosphate, formation in mixed fertilizers.....	26
in desert plants.....	728	Trichina—	
in plants.....	534	biology.....	83
in plants as affected by environment.....	522	larva in cerebrospinal fluid.....	881
in plants, automatic registration.....	729	<i>Trichinella spiralis</i> —	
scale, automatic, description, U.S.D.A.....	226	larva as affected by refrigeration, U.S.D.A.....	680
Transmutation, immunization.....	550	studies.....	83
Tree—		Trichiniasis, review of literature.....	478
crickets, relation to apple canker.....	653	Trichinosis in United States.....	276
diseases, notes.....	448	<i>Trichodectes hermai</i> —	
roach in Hawaii.....	59	n.sp., description, Cal.....	274
seed testing station at Everswalde.....	837	notes.....	552
seeds, methods of testing.....	837	<i>Trichoderma</i> —	
seeds, testing in Scandinavia.....	440	<i>koningi</i> , studies, Del.....	156
Trees—		<i>ignorum</i> , studies.....	226
berry-bearing, for birds.....	238	<i>Trichogramma</i> —	
bibliography.....	238	<i>pretiosa</i> , parasitic on bud moth.....	250
culture and care, N.Dak.....	836	spp., parasitic on codling moth.....	358
culture in Lucknow.....	232	<i>Trichoseptoria fructigena</i> on quince and apple.....	54
damage by lightning.....	510	Triphenyl, peroxidis of.....	502
diameter growth in.....	538	<i>Tritora flexa</i> , notes.....	360
for home grounds, N.Y.Cornell.....	741	<i>Trombidium holosericeum</i> , remedies.....	582
for latitude of St. Louis.....	439	Truck crops—	
forest, insects affecting.....	651	culture in Georgia.....	436
forest nursery, cost accounts for.....	641	insects affecting.....	851
forest, of Madagascar.....	742	<i>Trypanosoma</i> —	
girls-increment measurements.....	347	<i>maroccanum</i> n.sp., description.....	480
little leaf, of Cal.....	248	<i>rhodesiense</i> , relation to game.....	187
measurement of height.....	641	Trypanosome of Vinchuca, studies.....	580
new or noteworthy, from Colombia and Central America.....	827	Trypanosomes—	
of Cambridge Botanic Garden.....	152	filterability.....	880
of Indiana, range and distribution.....	637	in Russia.....	187
of Konahuanui region.....	537	passage into milk.....	385
of Missouri River basin.....	838	Trypanosomiasis—	
of Oahu lowlands.....	345	in guinea pigs, treatment.....	278
of Pacific coast.....	152	in horses, diagnosis.....	385
of Texas.....	640	in relation to dipping.....	188
ornamental, blooming dates, N.J.....	144	studies.....	576
ringbarked, killing with arsenic.....	485	Trypsin, effect on guinea pigs and dogs.....	276
sap ascent in.....	727	Tryptophan, determination in proteins.....	505
		Tubercle bacilli—	
		effect of daylight and drying on.....	880
		human type, in cattle.....	581
		immunizing tests on guinea pigs.....	82
		in apparently nontuberculous animals.....	277
		types of.....	575

	Page.		Page.
Tubercles, root. (See Root tubercles.)		<i>Tylenchus</i> —	
Tuberculin—		<i>angustus</i> on rice.....	49
delayed reactions following in-		<i>devastatrix</i> , notes.....	249
jection.....	187	<i>dipsaci</i> and <i>T. tritici</i> , notes.....	541
test in certified dairies.....	880	<i>similis</i> , description, U.S.D.A.....	30
test, intrapalpebral, studies.....	335	<i>Typhlocyba comes</i> . (See Grape leaf-hopper.)	
test, notes, Cal.....	274	Typhoid—	
test, studies.....	278	coli group, specific ferments for.....	278
use.....	679	fever caused by food at public	
<i>Tuberculina maxima</i> , studies.....	750	dinner.....	69
Tuberculosis—		fever, immunized milk for.....	272
avian, diagnosis.....	880	fever, transmission by factory.....	
avian, in pigs.....	277	infected candy.....	286
bovine, control in Hawaii.....	477	fig. (See House fly.)	
bovine, immunization.....	185,	Typhus in dogs.....	682
875, 581, 678		Tyrosin, effect on action of alcohol	
bovine, in children.....	678	on plant cells.....	333
bovine, in Illinois.....	185	Ultra-violet rays—	
bovine, increasing resistance to.....	478	absorption by arable soil, U.S.	
bovine, intradermal test for.....	185	D.A.....	414
bovine, physical examination		absorption by soils.....	817
and clinical diagnosis.....	184	effect on the eye, U.S.D.A.....	413
bovine, spread among farm		<i>Uncinaria canina</i> , notes.....	273
animals, Wyo.....	678	<i>Uncinula</i> —	
diagnosis.....	81	<i>necator</i> , hibernation.....	847
immunization, Cal.....	274	<i>spiralis</i> , treatment.....	841
in asses.....	82	United States Department of Agri-	
in Great Britain.....	382	culture—	
in horses.....	678	Bureau of Soils, field opera-	
in pheasants.....	386	tions.....	321
in the college herd, Pa.....	187	Forest Service, exhibit at San	
international control.....	575	Francisco.....	347
of lymph glands in children.....	677	Library, cooperation with other	
pulmonary, diagnosis.....	581	libraries.....	404
studies.....	575	Office of Markets and Rural	
transmission by factory-infected		Organization, work of.....	194, 410
candy.....	366	organization lists, U.S.D.A.....	94
Tuberculous tissue, iodine in.....	580	statutory history.....	796
Tubers—		Weather Bureau. (See Weather	
edible. (See Root crops.)		Bureau.)	
translocation of mineral consti-		United States Live Stock Associa-	
tuents, U.S.D.A.....	427	tion, report.....	184, 185, 273
Tumalo irrigation project in Oregon	85	Uranium, effect on sugar beets.....	38
Tumors—		Urban growth in United States.....	183
in domestic fowl, U.S.D.A.....	480	Urea—	
in man and plants, relation.....	249, 845	adding to diet.....	762
Turkeys, care and management.....	377	fertilizing value.....	315
Turp—		from lime-nitrogen, fertilizing	
house, investigations, Tex.....	452	value.....	25
weed, notes.....	332	nitrate, fertilizing value.....	25, 317
Turpins—		Uredineæ—	
culture experiments, Can.....	34	germination of teleutospores.....	718
fertilizer experiments.....	519, 632	sexuality in.....	826
fertilizer experiments, Ill.....	532	Uredo—	
susceptibility to swede mildew.....	52	<i>arachidis</i> , treatment.....	78
varieties.....	865	<i>orchidis</i> , notes.....	342
yield as affected by planting dis-		Uric acid—	
tance.....	527	determination in urine and	
Turpentine, larvicidal value.....	359	blood.....	412
<i>Tylenchus semipennatus</i> affecting		synthesis in human body.....	767
oranges.....	354	Urocystia—	
		<i>tritici</i> , notes.....	56
		<i>tritici</i> , treatment.....	64
		<i>violæ</i> , prevention.....	159

# INDEX OF SUBJECTS.

1005

	Page.	Vegetables—Continued.	Page.
<i>Uromyces albuginis</i> n.sp., notes.....	842	varieties for Georgia.....	438
<i>Drophiopsis alfalae</i> , notes.....	241	varieties for western Washing-	
<i>Uspulna</i> , fungicidal value.....	51	ton, Wash.....	798
<i>Ustilago</i> —		(See also specific kinds.)	
<i>reiliana</i> , inoculation on Guinea		<i>Felosiella cajani</i> n.g. and n.sp., de-	
corn.....	644	scription.....	52
<i>sacchari</i> , notes.....	50	Velvet beans—	
<i>tritici</i> , notes.....	845	as a cover crop, P.H.....	736
<i>Ustilina zonata</i> on rubber.....	57	hybridization experiments, U.S.	
Utah—		D.A.....	431
College, notes.....	497, 695	Ventilation—	
Station, notes.....	695	effect on hydrogen ion concen-	
Vaccinia, complement fixation in.....	877	tration of blood.....	260
<i>Vahlkampffia calkenst</i> , life history.....	858	poor, effect of.....	185
<i>Valse</i> sp., notes.....	247	studies.....	70, 192, 416
<i>Vanduzee arguata</i> , life history.....	754	Venturia—	
Vanillin—		<i>inaequalis</i> as affected by cold,	
effect on plant growth, Tex.....	126	U.S.D.A.....	538
effect on wheat plants.....	325	<i>inaequalis</i> , notes.....	247, 843, 846
Vapor tension in western and equa-		<i>pyrina</i> , notes.....	247, 846
tatorial Africa.....	320	Veratrin, detection in water.....	410
Variability and amphimixis in <i>Spiro-</i>		Vermis, body, remedies.....	358
<i>gyra inflata</i> .....	370	Vermont University, notes.....	97, 900
Varicella, complement fixation in.....	877	Verruga, investigations.....	353, 858
varity tests, correcting for soil dif-		Vertebrates, Australian, erythro-	
ferences, U.S.D.A.....	829	cytes of.....	577
(See also various crops, fruits,		<i>Vespa crabro</i> , notes.....	752
etc.)		Vetch—	
ariola, complement fixation in.....	877	culture experiments, Ga.....	138
cal immature, as food, U.S.D.A.....	557	effect on milk and butter.....	570
vegetable—		fertilizer experiments.....	517
chromogens, oxidation and re-		hairy, as a cover crop for cherry	
duction in.....	32	orchards, Oreg.....	231
compounds, humification.....	516	purple, as a cover crop for	
food product, investigations.....	256	citrus.....	344
foods, preparation and use, U.S.		wild, effect on baking quality of	
D.A.....	899	wheat, U.S.D.A.....	558
protein. (See Protein.)		yield as affected by sulphur.....	726
saps, physico-chemical proper-		Veterinary—	
ties.....	30	dissection, guide.....	480
seeds, growing in Canada.....	635	inspection in Brazil.....	372
Vegetables—		instruction in Austria.....	674
acclimatization, U.S.D.A.....	231	medicine, progress in.....	876
canning.....	714	medicine, teaching.....	195
culture.....	833	pathology, text-book.....	477
culture experiments.....	436	police, international, formation.....	306
culture experiments, S.C.....	635	posology and therapeutics, hand-	
culture experiments, U.S.D.A.....	231	book.....	777
culture in British Columbia.....	436	work in foreign countries.....	576
culture in Georgia.....	436	<i>Vinca rosea</i> as a host of eelworm.....	349
culture in New York.....	40	Vine borers, notes, Mo.Fruit.....	361
culture in Philippines.....	635	Vinegar—	
culture in South Australia.....	341	definition, Me.....	67
dried, microbiology.....	460	from maple sap skimming, anal-	
fertilizers and green manure		yses, Mich.....	714
crops for, Iowa.....	836	inspection, Me.....	67
fertilizer experiments, Ill.....	532	manufacture, Me.....	67
fertilizers for.....	436	Vines—	
fertilizers for, Ill.....	40	propagation.....	533
importance in the dietary.....	40	sulphur as a fertilizer for.....	331
insects affecting.....	651	Vineyards, reconstitution in Sicily.....	740
preserving alone and with meat		(See also Grapes.)	
varieties.....	436	Violet smut, prevention.....	750
varieties, S.C.....	635		
varieties, U.S.D.A.....	231		

	Page.	Water—Continued.	Page.
Virginia—		irrigation, from potassium	
College and Station, notes	497	chloride works	328
creeper, dissemination by Eng-		irrigation, measurement	388
lish sparrows	629	irrigation, measurement, U.S.	
Viruses—		D.A.	881
filterable, notes	575	irrigation of high Alps, analyses	85
ultramicroscopic, notes	575	irrigation, temperature as af-	
<i>Vitis riparia</i> , seed oil of	501	fecting citrus seedlings, Cal.	235
Vivian experiment and demonstra-		irrigation, text-book	481, 482
tion farm, S.Dak.	735	judgment	389
Viviparomusca, erection	253	level in Gangetic plain	586
Vocational education—		level in wells, relation to rain-	
cultural value	897	fall	319
in Illinois	598	mechanically filtered, character-	
Volcanic dust, effect on climate	415	istics	433
Wages in India	195	meter, Dethridge, description,	
Wagons, standardization	88	Colo	682
Walking, effect on metabolism	260	mineral and potable, analyses,	
Walnut—		Ky	683
blight, notes	639	mineral content as affecting	
blight of bacteriosis, studies	545	canned goods	67
melaxuma, notes	56, 353	movement in soils, U.S.D.A.	215
melaxuma, studies, Cal.	447	mud-laden, use in drilling wells	884
Walnuts—		percolation and retention in	
breeding	639	soils, Mich.	216
culture in Arizona, Ariz.	236	percolation in soils	121
French and Asiatic varieties	835	power in south-central Alaska	786
grafting, Ariz.	236	power on farms	84
Quercina, origin	236	powers of Yakima River basin	884
Washington—		purification plants, treatise	390
College, notes	97, 600	reduction of alkalinity due to	
Station, notes	600, 798	filtration	483
Station, report	796	removal of lead from	396
Wasps of West Indies	857	requirements of crops, Wash.	750
Water—		requirements of plants	396, 521, 522
absorption and secretion by liv-		spring, radio-activity of	522
ing plants	111	sterilization by lime	287
analyses	84	sterilization by Schumann rays	683
artesian, in Australia	284, 483	supply, bacteriology and chemis-	
bacteriological examination	284,	try of	84
	285, 286	supply for country homes	83, 285, 769
conduits for	483	supply for farms	185, 285, 585
conservation in New South		supply, forecasting	398
Wales	785	supply, ground, developing for	
determination in slrups	611	private use	483
disinfection with bleaching		supply of Colorado River basin	683
powder and liquid chlorine	885	supply of farms in Kansas	84
distilled, effect on plants	825	supply of Hawaii	261
distilled, toxicity	827	supply of Hudson Bay basin	284, 683
drinking, studies	763, 862	supply of Massachusetts	682
duty of, Cal.	282	supply of Navajo and Hopi In-	
duty of in irrigation	884	dian reservations	284
examination, treatise	609	supply of North Atlantic coast	
gas tar as a coating for concrete	889	basins	453
ground, in LaSalle and Mc-		supply of North Pacific drain-	
Mullen counties, Texas	786	age basins	884
hardness and color in relation		supply of Oregon	294
to health	683	supply of Pennsylvania	78
hemlock, chemistry and toxico-		supply of Philippines	388
logy, Nev.	185	supply of south Atlantic and	
hot, fungicidal and insecticidal		supply of south Atlantic and	8
action	243	eastern Gulf of Mexico basins	284, 48
hot, use against insects	50	supply of Texas	284, 68
in meat products	365	supply of upper Mississippi	
irrigation, analyses	512	River basin	68
irrigation, economical use, Cal.	282	supply of Victoria	

# INDEX OF SUBJECTS.

1007

Water—Continued.	Page.	Wells—	Page.
supply of Waterbury area.		boring .....	683
Connecticut .....	683	breathing, U.S.D.A. ....	614
supply of western Gulf of Mex- ico basins .....	389	drilling, use of mud-laden water in .....	884
supply profile surveys in Ore- gon .....	84, 284	protection, Wash. ....	790
supply profile surveys in Wash- ington .....	84, 284	use in land drainage .....	885
supply, protection, Wash. ....	790	West Virginia—	
supply, relation to rainfall .....	510	Station, bulletins available....	197
supply, treatise .....	83	Station, notes .....	98
Watermelon—		University, notes .....	98
"pink spot, notes .....	843	Whale oil, hydrogenated, properties..	9
wilt, relation to contaminated seed, N.C. ....	53	Wheat—	
Watermelons, varieties, U.S.D.A. ....	232	analyses .....	760
Waterspouts off Cape San Lucas, U.S.D.A. ....	614	and barley, hybrid between....	339
Waxes, technology and analysis, treatise .....	507	and rye, hybrid between....	230
Weather—		bran, analyses .....	72, 263, 560, 767
Bureau and the physician .....	509	bran, analyses, Ind. ....	263
Bureau, Division of Agricul- tural Meteorology .....	601	bran, analyses, Kans. ....	169
Bureau exhibit at San Fran- cisco, U.S.D.A. ....	413	bran, analyses, Mass. ....	467
Bureau, instructions to observ- ers, U.S.D.A. ....	500	bran, analyses, N.J. ....	665
Bureau terms used to design- ate storms, U.S.D.A. ....	118	bran, analyses, Tex. ....	467
changes as indicated by halos .....	207	bran, analyses, Vt. ....	371
effect on crop yields .....	415	bran extract, effect on growth of rats .....	258
effect on nitric and nitrous acids in rain, U.S.D.A. ....	118	composition as affected by fer- tilization and soil preparation..	230
forecasts by laymen, U.S.D.A. ....	414	culture, Ga. ....	138
handbook .....	413	culture, S.C. ....	694
of Hertfordshire .....	320	culture, continuous, N.J. ....	188
of north Atlantic in August, 1914, U.S.D.A. ....	118	culture experiments, Cal. ....	227
of Ohio, Ohio .....	118	culture experiments, Kans. ....	330, 632
of Pennsylvania in 1682, U.S. D.A. ....	414	culture experiments, N.Mex. ....	735
relation to moon .....	509	culture experiments, S.Dak. ....	230
relation to soil formation .....	514	culture experiments, U.S. D.A. ....	137, 228
sayings, Arabic .....	413	culture experiments, Wash. ....	39
Weed seeds. (See Seeds, weed.)		culture in Australia .....	227
Weeds—		culture in the Tropics .....	227
composition, N.Dak. ....	39	culture under dry farming, Idaho .....	734
destruction, Ind. ....	736	culture under irrigation, Colo. ....	528
eradication, Oreg. ....	228	density as an index of milling value .....	256
in Union of South Africa .....	241	diseases in New South Wales .....	845
relation to soil fertility, N.Dak. (See also specific plants.)	30	durum, milling and baking tests, N.Dak. ....	67
Weevil—		effect on soil moisture .....	17
larva, dung-bearing, notes .....	556	feeding, Ohio .....	494
stalk borer, bird enemies of, U.S.D.A. ....	849	feeding value, Tenn. ....	807
Weevils and weevil products, use in food and medicine .....	361	fertilizer experiments .....	22, 25, 423, 424, 518, 519, 520, 622
Weir notches, flow of water through, U.S.D.A. ....	881	fertilizer experiments, Kans. ....	632, 800
Weils—		fertilizer experiments, Mich. ....	723
irrigation, description .....	388	fertilizer experiments, Pa. ....	128, 131
proportional flow, tests .....	785	fertilizer experiments, Wyo. ....	630
Well casings, corrosion .....	483	flag smut, treatment .....	644
		flour. (See Flour.)	
		germinating, disease of .....	644
		germination as affected by silver nitrate .....	111
		gluten, colloidal swelling .....	31
		grass, western, bacterial dis- ease of .....	349

Wheat—Continued.	Page.	White—	Page.
grass, western, Phoma disease.....	846	ants. (See Termites.)	
growth as affected by alkali		fly, citrus, notes.....	60
salts, U.S.D.A.....	125	fly, citrus, remedies.....	451
hard spring, varieties, U.S.D.A.....	39	fly, greenhouse, in Ohio, Ohio.....	59
heads, fungus disease of.....	845	fly, greenhouse, life history and	
hybridization experiments, Oreg	228	habits.....	452
inheritance in.....	531	fly, mulberry, notes.....	732
insects affecting.....	851	grubs, eradication, Ohio.....	454
kernel, development.....	633	grubs, hyperparasites of.....	555
liming experiments, Pa.....	132, 133	grubs in greenhouse soils, N.J.....	161
manganese in, U.S.D.A.....	339	grubs injurious in Porto Rico.....	733
middlings, analyses.....	72, 767	grubs, notes.....	732
middlings, analyses, Mass.....	467	grubs, parasites of.....	733
middlings, analyses, N.J.....	665	(See also May beetles.)	
middlings, analyses, Vt.....	371	scours in calves.....	275
mildew, notes.....	243, 644	Whooping cough, transmission by	
milling and baking values, N.		factory-infected candy.....	386
Dak.....	759	Whortleberry, coloring matter of.....	700
mixed feed, analyses, Kans.....	169	Willow borer, remedies.....	656
nitrogen content as affected by		Willows, culture and use, U.S.D.A.....	347
culture, Wash.....	735	Wilting in plants, studies.....	728
of Algeria and Tunis.....	227	Wind observations, working up, U.S.	
prices and shrinkage, Ill.....	337	D.A.....	614
protein content, following black		Wine—	
fallow.....	230	formation.....	43
rust, notes.....	843	making, cooperative societies in	
rusts in Canada.....	51	France.....	690
screenings, analyses, N.H.....	188	making, yeast and sulphurous	
seed bed preparation, Kans.....	632	acid in, Cal.....	297
seed, failure to germinate.....	541	<i>Winthemia quadripustulata</i> , para-	
seedlings, respiratory activity in		sitic on army worm.....	251
sunlight.....	30	Winthrop Farm School, Rock Hill,	
shorts, analyses, Tex.....	467	South Carolina.....	597
smut, treatment.....	51, 844	Wire fences—	
stalk disease, studies.....	244	construction.....	487
stem sawfly, western, studies.....	250	cost data, U.S.D.A.....	498
stinking smut, investigations,		Wisconsin University and Station,	
Wash.....	644	notes.....	98, 396, 738
stinking smut, studies.....	644, 845	Wistaria seed as affected by pod po-	
stinking smut, treatment.....	843	sition, N.J.....	134
straw, composition and diges-		Witches' brooms, winter rest in.....	135
tibility.....	565	Women in horticulture and agricul-	
text-book.....	293	ture.....	492
transpiration in.....	522	Women's—	
valuation.....	256	clubs, outlines for.....	599
varieties, Cal.....	227	institutes in Canada.....	597
varieties, Ga.....	138	Wood—	
varieties, Idaho.....	734, 735	analyses.....	425, 561
varieties, Pa.....	143	ashes, analyses, Conn.State.....	521
varieties, U.S.D.A.....	229, 733	ashes, analyses and use, S.C.....	516
varieties, Wyo.....	629	ashes as a corrective for cotton-	
water requirements, Wash.....	720	seed meal toxicity, N.C.....	75
yellow rust, studies.....	51, 349	destruction by fungi.....	547
yield in relation to meteo-		disinfection.....	789
logy.....	208, 319	flour, nature and use.....	639
yield in relation to moisture,		nutritive value.....	561
Kans.....	338	of Brazil.....	449
yields, Nebr.....	228	oil, Chinese, polymerization.....	807
Wheatstone bridge, use in biological		pipe, life of.....	358
studies, Mich.....	732	preservation, importance.....	240
Whey—		pulp industry in Canada.....	48
heated, nutritive value.....	369	using industries in Indiana.....	155
pasteurization, N.Y.State.....	673	using industries in Kentucky.....	639
		utilization, rôle of chemistry in.....	358

# INDEX OF SUBJECTS.

1009

Wood—Continued.	Page.	<i>Xyleborus</i> —	Page.
volume and increment tables..	743	<i>dispar</i> , notes.....	851
waste, utilization.....	839	<i>immaturus</i> in Hawaii.....	59
(See also Lumber and Timber.)		<i>Xylina</i> —	
Woodlot products, marketing.....	839	<i>antennata</i> . (See Green fruit	
Woodlots—		worm.)	
care and improvement, U.S.D.A..	839	<i>bethunei</i> , carnivororous habits...	255
survey in New York, N.Y. Cor-		Xylose, isomeric tetracetates of....	408
nell .....	741	Yams—	
Wool—		insects affecting .....	349
amino group in.....	202	mucinase in .....	312
handling and marketing, U.S.		Yeast—	
D.A. ....	372	as a food.....	164
handling and marketing in		chemistry of .....	711
United States.....	265	composition and digestibility....	165
maggots of sheep in United		dried, as a feeding stuff.....	298
States.....	554	dried, effect on milk.....	471
marketing cooperatively.....	91	use in wine making, Cal.....	207
of wool-producing and of kemp-		waste as a feeding stuff.....	262
producing sheep.....	468	Yellow jasmine, poisoning of cat-	
production, consumption, and		tle by, N.C.....	80
prices.....	668	Yerba rosario, culture, P.R.....	736
production, inheritance.....	74	Yoghourt—	
scouring wastes, analyses and		<i>bacillus</i> , tests of strains.....	574
treatment.....	688	preparation and use, U.S.D.A....	474
scourings as a source of potash..	328	Yttrium, effect on permeability....	34
shrinkage in weight .....	372	Zacaton as a paper-making material,	
Woolly aphids. (See Aphids, woolly.)		U.S.D.A.....	318
Workingmen. (See Laborers.)		Zarzaparrilla, culture, P.R.....	736
Worm—		Zebus and bantengs, zoological re-	
nodules in cattle.....	581, 582	lationship.....	466
parasites of Queensland.....	576	Zein proteases, physiological action..	71
Wormwood oil industry in Wiscon-		Zelite potash, solubility.....	328
sin.....	237	<i>Zenura pyrina</i> . (See Leopard-	
Wound tissue formation, notes.....	249	moth.)	
Wounds, treatment.....	675, 876	Zinc—	
Wyoming—		arsenate, insecticidal value,	
Station, report.....	694	U.S.D.A.....	60
University and Station, notes...	497	detection in water.....	410
Xanthium, isolation of types in....	32	Zodiacal light, nature, U.S.D.A....	117
Xanthophyll, elaboration in <i>iris</i>		Zoology—	
<i>germanica</i> .....	524	Canadian, bibliography.....	651
<i>Zinnia mexicana</i> n.sp., description..	556	yearbook .....	494

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